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Contractors and Engineers Monthly

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PICKS and SHOVELS

By O. E. POTTER

Plans for Destroying Roads

The war clouds over Europe seem to be casting their shadows unexpectedly in many places. While the highway engineers in most countries are concentrating on the problem of providing highways of the longest possible life, and maintenance engineers struggle to preserve such roads as are in existence, there comes from Prague, Czechoslovakia, the astonishing news that provision is being made for the possible destruction of the highways of that country.

Highway and road bars, including movable bars; permanent obstacles to close roads; permanent equipment to install obstacles in time of need; permanent equipment for destroying highways and roads; and warehouses for explosives and other materials serving to disrupt transportation are listed in the seventh administrative decree of the Czechoslovak National Defense Law as necessary preparations to make transport on highways and roads impossible, if the need should arise.

We may well be thankful that we live in a country where roads are built to drive over, for business or pleasure, and not as pathways to war.

New Contract Bidding

In England there has been some discussion of giving contracts to the next-to-lowest bidder on the basis that the lowest bid practice gives rise to the problems of price cutting, chiseling and inferior work. One official suggested that awards be made to the bidder who was the average of all bids. *B.T.E.A. News and Opinions* wants to know how any contractor would go about bidding on a job so his bid would be half way between high and low.

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Hog Wire Stops Stream Erosion

Velocity Checks, Properly Installed, Prevent Erosion: Examples of Their Use in Arizona

(Photos on page 36)

IN an endeavor to find a less expensive and more effective type of velocity check for the protection of the banks of streams and in arroyos, the Arizona State Highway Department has, through its Assistant District Engineer, Harry Duberstein, Districts Nos. 3 and 4, developed a hog-wire and rail check which when properly installed will do the trick. Even before the velocity checks had been generally approved for use in the District, an emergency arrived which gave them an opportunity to demonstrate their effectiveness.

Saving Concrete Paved Banks

An arroyo near the city of Nogales had caused some trouble through the rapid erosion of the banks. In order to preserve the adjacent property, the banks of the arroyo were lined with concrete slabs carried to the bottom of the stream bed but the bed was not paved. A series of rains during the short wet season, from about the middle of July to the end of September when only a few inches of rain falls but does incalculable damage through erosion and the transporting of tons of soil from farming and grazing lands, started to wash out the bottom of the creek. The slabs were being undermined and were threatened with loss. Between storms the state highway maintenance crew went into the arroyo and drove short sections of rails and fastened pieces of triangular mesh hog fence to the rails. When the next rains came rushing down the arroyo with their burden of soil, the breaking of the flow of the water by the eddies around the wire of the fence caused the water to be slowed up in its flow and deposited the soil at the checks. The soil was deposited up to the tops of the individual checks which were at the elevation of the bottom of the con-

(Continued on page 20)

Concrete Paving in Missouri Under 1936 Specifications

Save, Not Dodge, Taxes

"Anyone may so arrange his affairs that his taxes shall be as low as possible; he is not bound to choose the pattern which will best pay the Treasury; there is not even a patriotic duty to increase one's taxes," said Judge Learned Hand.

Because of the many special tax problems affecting contractors, we are starting in this issue a series of articles on contractors' taxes, with suggestions as to the legitimate ways and means of so planning business transactions as to minimize the various Federal and state taxes.

See Page 24

Amendment to Stop Diversion Sought in Massachusetts

Forms for signatures to the Initiative Petition for an Amendment to the Massachusetts Constitution to stop gasoline tax diversion are being circulated in the Bay State, according to a recent issue of *The Nerba*. At least 25,000 signatures of registered voters must be obtained on the petition before the first Wednesday in December in order to bring the matter before the legislature for action.

Because of the necessary formalities in amending the Massachusetts Constitution, the matter will not be on the ballot for submission to the people at a state election until 1940, but it is believed that the fact that a substantial number of registered voters have signed the petition will undoubtedly have a restraining influence on the diversion of highway funds during the period while the amendment is pending.

The New England Road Builders Association is cooperating with the Motor Vehicle Owners Conference of Massachusetts in the circulation of the initiative petitions for signatures.

C. H. Atkinson Paving Co. Widened Old Concrete Slab for 6.429 Miles Between Eureka and Pacific, Mo.

(Photos on page 36)

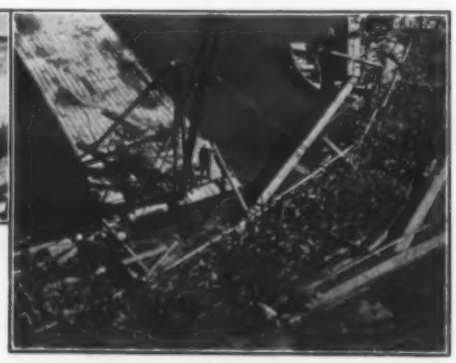
A TYPICAL paving contract under 1936 specifications was completed by C. H. Atkinson Paving Co., of Chillicothe, Mo., last summer on the traffic relief route, U.S. 66, between Eureka and Pacific, Mo. This project, FAP 608 A and B, St. Louis County, required the laying of a 10-foot widening strip for 6.429 miles. Perhaps the outstanding feature of this work was the dispatch with which it was prosecuted and the use of all the types of equipment which were formerly seen on concrete paving work. The completion of the work seemed to be the object, rather than the use of an uneconomical number of men.

The existing highway was 20 feet wide with added 10-foot strips at bridge ends and transitions at the beginning of the project. On these locations the portions of the widening strips that had been in place were cut out square to permit the new strip to be laid uniform. The old pavement was cut out by drilling a series of holes across the strip with a jackhammer powered by a Chicago Pneumatic portable compressor and then the 9-foot blocks lifted to break them away from the old slab by using a Simplex mechanical jack.

On other sections the wide earth shoulder left for this future widening was cored out with an Austin No. 12 grader pulled by an Allis-Chalmers tractor for the full 10-foot width. This strip was uniformly 9-7-9 inches thick. Following closely behind, the Ted Carr Formgrader cut the trench for the 9-inch

(Continued on page 18)

FREEZING A GREAT CLAY BANK TO CHECK A LANDSLIDE AT GRAND COULEE



At Left, the Crevasse in the Foreground and Beyond, the Clay Bank Where the Slide Occurred; Above, the Refrigeration Plant; Right, the Tops of the Freezing Pipes. See Page 9.

C. & E. M. Photo

The Center of a California Labor Camp, Showing the Type of Buildings and Landscaping

Underpass and Bridge Problem in Nevada

Spur Tracks Removed, and New Culverts Replaced Old Irrigation Ditches in Reno on J. F. Knapp Contract

THE largest underpass in the state of Nevada is nearing completion in Reno, where a new bridge crosses the Truckee River and leads directly into the underpass beneath the tracks of the Southern Pacific Railroad. Its construction required the removal of three spur tracks and it is carried under the two main line tracks and one spur track. The Alameda Street underpass has a 24-foot roadway and two 5-foot side-walks. Its construction removes one of the heaviest traveled crossings in the city and the scene of many accidents.

The bridge on the south side of the underpass is 187 feet 8 inches long and consists of two 32-foot approach spans, which are solid fill V-type abutments, two 57-foot 11-inch spans and a center span of 71 feet 10 inches of steel beams and concrete deck construction. There is a 40-foot section of roadway on a 4 per cent grade between the bridge and the underpass. The underpass, which is 200 feet long, goes from a minus 4 per cent grade at the bridge end to plus 6 per cent on the north approach in a vertical curve. The north approach walls of the underpass are cantilever section while the walls of the underpass proper are gravity section.

No excavation was necessary for a

(Continued on page 12)

Rebuilding Men By Building Roads

California's Remarkable System Far Different From the Convict Chain Gangs of Old

"A JOB in a prison road camp is the most sought after assignment San Quentin can bestow" writes James B. Holohan, retired Warden of San Quentin prison, in one of a series of articles on prison life in the *Sacramento Union*. But what the penologist may say of a scheme does not always carry weight with the layman who thinks that many prisoners are treated too well within the prison walls. We will take more stock in what the engineers of a state highway department say of the work of a group of prisoners assigned to jobs on the roads of California. They agree that the work is well-done, faithfully performed and the men gain in confidence, character and health in the months before they are again to be free to face the world.

There are six of these camps for convicts distributed quite evenly over the state of California. As you pass the men on the road they seem no more like convicts than any other group of men at work on the highways of the country. In order that the men may not be tempted to run away, they are usually located somewhat away from centers of population and in places where there is real work to do for the state highway system which either could not be done by other methods of financing or that is too much of a hazard to perform by contract.

Life in the Camps

In size the camps vary from as many as 200 men down to about 50 men but the larger camps are usually the order as they are more economical to operate. The total number of convicts who are resident in camps at the present time is about 650 and working on the same jobs are about 225 free men who operate tractors, trucks and power shovels.

Warden Holohan said that the assignment to a prison camp is much sought after. Why? Is it an opportunity to get away from prison life? Does it offer a chance for escape? The answer is yes to both questions but less than one per cent of the men sent out to the camps in the last ten years have made any attempt to escape. They must have served the greater portion of their term in prison and no matter what the crime for which they were convicted they may be sent to the camps if their record in prison is without blemish. Further, they are not forced to go to the camps but are permitted to go if they wish and have a good record behind them.

Two things make the service in camp desirable for the man behind the bars in addition to the out-door life and freedom from the prison routine. He receives a day off his term for every three days he serves in the camp. For example, if a prisoner is in camp eight months he is credited with twelve months on his term. He is paid $2.10 a day for his work on the road but from that he must pay his board and keep. In other words the camp must be self-supporting and he pays the way. If the man is ill his pay stops and he is not paid for Sundays or holidays, but only when he is producing good honest hard labor for the state highway department.

From his daily wage comes the cost of transporting him from and back to the prison, the guarding of the camp by unarmed guards who have nothing to do with the men when they are working on the road. During that time they are day laborers working for the highway department. The guards merely look after them when they return and see that none have strayed. There is a check at meals and in the bunk house at night and rarely does a man fail to answer when his name is called. There is a $200 reward for the return of any man who runs away from the camp and the reward must be paid by the camp from which he escaped. Thus no man who is honestly working to set up some money with which to make a fresh start in the world wants to see a fellow worker leave the camp. He will do everything in his power to dissuade him.

The maintenance of the camps is in the hands of competent superintendents who have no connection with the prison system but are in fact subject to the same control as contractors who are working for the state. They are expected to perform a task such as grading a certain number of miles of roadway or driving a series of tunnels for a sum estimated by the engineers of the highway department and if they fail they are replaced. This does not mean that the superintendents are in any way Simon Legrees. On the contrary they are most interested in making the men comfortable and seeing that they have a sufficient amount of amusement. For that purpose athletic goods are purchased with the camp funds, there are radios in each camp, and movie films are rented for use in the common recreation hall.

The men are bunked eight to a house and the houses are well built of sections lined with Sisalkraft paper for warmth. The free labor in the camp is segregated in another section of the camp. There is a barber shop, a shoe shop, and hospital in each camp manned by the men assigned to the camp. The bake shop, butcher shop and kitchen are all operated by the prisoners but at times it

(Continued on page 17)

"Night and Day" Was the Theme Song of the Highland Co., Inc., on Its Grading Contract Northwest of Covington, Ind. Here Caterpillar Tractors and 12-Yard Carryall Scrapers Worked Around the Clock on a 30-Foot Cut Where 50,000 Yards of Earth Was Moved.

Bringing Home Profits By Good Management

Site of Borrow Pit and Smart Moves of Shovels Speed Pa. Grading Job of H. J. Williams Co.

NOT a great amount of grading but the proper solution of the problem "how to handle it" means the making or breaking of a job, reported C. O. Albright, Superintendent for H. J. Williams Co., Inc., of York, Pa., contractor for FAP 900-B, a 2.27-mile dual-type pavement southwest of Shippensburg, Pa. The key to the solution on this job lay in the selection of an advantageously-located borrow pit and a judicious game of checkers with the wagon drill and the shovels.

There were three major cuts: the first of about 4,500 yards 1,000 feet from the southwest end of the job; the second and third about equidistant from the first and each other totaled 9,000 yards and were 90 per cent rock, while the first had only 20 per cent rock. The excavation on the job was 24,500 yards of unclassified excavation and 23,000 yards of borrow.

Playing Checkers

An Erie 1-yard steam shovel was started in the first cut on April 13 and two days later a Marion 1¼-yard steam shovel was put into the same cut. This cut averaged 6 feet deep, was about 800 feet long and 50 feet wide. They began moving out the overburden from this first cut while a wagon drill was put into the second cut of 5,800 yards, 90 per cent rock. Holes were drilled on 5-foot centers to 2 feet below subgrade over one half the area of the cut and shot at one time.

By this time the first cut was about cleaned up as far as the earth was concerned and the shovels were moved into the second cut while the wagon drill went forward to the third cut of about 4,100 yards and drilled that the same as the second.

About April 23 a third shovel, another Erie 1-yard steam shovel, came onto the job and was equipped as a crane with a ¾-yard clamshell bucket. It started digging the three 8 x 8 x 12-foot deep sumps for drainage where it was impossible to carry surface drainage to any stream, and also removed old corrugated iron culvert pipe from the street car section on the south side of the right-of-way. The street car line had been abandoned several years ago and the rails and trolley wire removed but the ballast for the tracks and the grade remained. In the cut sections the street car grade was left and in the fills, in some sections, the fill was carried practically to grade on the shoulder at the side of the street car grade to permit the storage of material from the old bituminous macadam roadway and eliminate rehandling. The specifications required the use of this material in the shoulders of the new road. After the sumps were completed this shovel was put on light work, totaling about 2,000 yards at the southwest end of the job, with a small organization. This permitted keeping the bulk of the equipment and men together on heavy work.

Drilling and Blasting

The rock encountered on this project

(Continued on page 14)

C. & E. M. Photo

Blasting Machine and Novel Reel for Blasting Wire

Machine spreading TEXACO Asphaltic Concrete mix (cold laid type) on 10-mile N.Y. State highway in Chautauqua County.

Center: Compacting the ribbon of TEXACO Asphaltic mix laid down by the machine spreader.
Bottom: View of the completed surface, showing its safe, skid-proof texture.

ANOTHER 10 MILE LINK in NEW YORK STATE'S HIGHWAY SYSTEM

Again New York State increases the mileage of cold-laid TEXACO Asphaltic Concrete on its State Highway System. A 10-mile section of this durable, skid-proof, economical surface has just been completed in Chautauqua County.

From widespread experience on hundreds of miles of its State Highway System, New York has proved to its complete satisfaction the ability of this TEXACO Asphaltic surfacing to stand up under severe traffic impact and to provide maximum safety under all weather conditions.

In the wide variety of road and street surfaces made available by TEXACO Asphaltic products, the public official will find a completely satisfactory answer to his particular needs. Why not discuss matters with an experienced TEXACO Asphalt specialist?

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Politicians Still Grab State Highway Funds

Taxes paid by road users and motor carriers to the amount of $146,449,711 were diverted to other than highway purposes in 1935, according to reports of the Bureau of Public Roads by state authorities. This is an increase of more than $24,000,000 over the money which was grabbed from these taxes by politicians for other than highway use in 1934.

Diversions were made mostly to general state, county and municipal funds. More than $86,000,000 was so diverted, in greater part to state funds. More than $15,000,000 was diverted to relief of unemployment or destitution. Nearly $31,000,000 was diverted for education. Approximately $14,000,000 was diverted for miscellaneous purposes such as airports, navigation, service of non-highway debts, irrigation, parks, oyster propagation and other purposes.

The total diversions for 1935 are given below. Loans made from highway-user revenue that are to be repaid are not included as diversions.

Alabama	$ 453,183
Arizona	192,344
Arkansas	68,118
California	1,282,510
Colorado	984,277
Connecticut	103,375
Delaware	561,169
Florida	6,986,495
Georgia	5,582,148
Idaho	None
Illinois	7,505,978
Indiana	2,102,591
Iowa	None
Kansas	None
Kentucky	None
Louisiana	1,869,184
Maine	None
Maryland	463,148
Massachusetts	9,527,688
Michigan	352,161
Minnesota	156,099
Mississippi	775
Missouri	None
Montana	None
Nebraska	1,113,218
Nevada	None
New Hampshire	None
New Jersey	5,821,030
New Mexico	390,432
New York	58,526,852
North Carolina	1,757,462
North Dakota	905,776
Ohio	9,726,633
Oklahoma	3,494,006
Oregon	None
Pennsylvania	5,161,045
Rhode Island	671,750
South Carolina	140,880
South Dakota	2,356,601
Tennessee	2,654,785
Texas	8,290,061
Utah	None
Vermont	None
Virginia	28,849
Washington	1,002,791
West Virginia	2,392
Wisconsin	5,089,317
Wyoming	None
District of Columbia	924,589
Total	$146,449,711

How much longer politicians are going to be able to play this game with the millions of automobile and motor truck owners remains to be seen. Already taxpayers, chiefly among motorists, are rising mightily in their wrath and putting a stop to it in isolated states. May the number of these isolated states become legion, even unto 48!

The responsibility of a state highway department to its citizens increases with every mile of new road that is constructed. A set appropriation continuing year after year with a certain proportion always spent on new construction means the deterioration of the older roads at a higher rate because the amount of maintenance money available per mile decreases with every mile of new road built.

A new mile of road built or another mile of road kept open in the winter by the removal of snow means added money poured into the state treasury from gas taxes and every penny of this money should be available to the state highway department for maintenance service and new construction. Gas tax monies are ample to finance state highway departments in all of the work they undertake. If politicians can only be compelled to keep their itching fingers out of the bag, funds from income taxes and real estate taxes can be used for other state services. Keep gas tax money for roads alone!

Center Stripes—The Boon and Bane of the Motorist

"I know that center stripes are a big help in telling the other fellow where his side of the road stops, and they have added a lot of safety to driving, but I'll be darned," said the many-state motorist, using a somewhat stronger word than we have recorded, "if I can fathom the variety of lines these state highway engineers paint on their roads.

"I get accustomed to sticking to the right of a solid white line—I believe in them, too—and then comes a long straight stretch and I'm behind a slow trailer, car after car jumps around me and the trailer, and then I find out that in that state a solid white line doesn't mean a thing."

And so he continued, calling attention to dots and dashes for center stripes in one state, double lines in California with an orange stripe between where you can't cross; in another state no lines over some hills or on some bad curves and then a few miles along, neat white lines on curves and hills where the motorist can see a half-mile ahead.

"What does it mean?" asks M-S Motorist. "It's all very well for the fellow who stays in his own state or in the local maintenance district, but the chap who goes far and wide, and there are hundreds of thousands of us these days, does not know what to make of the lack of uniformity of center lines within the borders of a single state, and as far as any agreement between states, that's hopeless. Perhaps they'll get together some time."

How about it?

Cooperation With Nature

In presenting the stainless steel plaque symbolizing the choice of the Lorain Road Bridge at Cleveland, Ohio, as the most beautiful steel bridge of its size built last year, C. G. Conley of the Mount Vernon Bridge Co. and President of the American Institute of Steel Construction, sponsors of the award, spoke briefly.

He said, "To me it is peculiarly inspiring to have part in any man-made structure that so successfully cooperates with nature. Nothing we can build may match the majestic beauty that has been bestowed by nature upon this valley. We are happy that nothing has been built here that would conflict with that beauty."

Contractors' Problems Subject of Lectures

A series of lecture-discussions on contractors' methods, organization and equipment is underway at the College of Engineering of New York University, New York City. The series, which started on October 19 at the University Heights center of the University, under the direction of Professor C. T. Schwarze, will cover buildings, roads, structures, labor, materials, contracts, bids and other phases of contracting.

The lectures already given include "Construction Methods in Laying Large Pipes," by J. E. Longley, Secretary, Lock-Joint Pipe Co.; "Contract Forms and Bids," by Charles B. Ferris, Chief of Real Estate Department, Guaranty Trust Co., New York; "Contractors' Methods in Paving with Brick" by William C. Perkins, Chief Engineer, Eastern Paving Brick Assn., Langhorne, Penna.; and "Construction Methods with Pre-Cast Concrete" by Charles Gilman, Vice President, Massey Concrete Products Corp.

On November 16, Robert W. Boyd, District Director, TERA, New York, will lecture on "Human Engineering for Contractors" and the remainder of the series will be as follows:

November 23, "Contracting with Company Forces" by Harry C. Carpenter, engineer and contractor, Middletown, N. Y.

November 30, "Contracting on Highways" by Richard Hopkins, Richard Hopkins Co., Albany, N. Y.

December 7, "Materials for Good Highways" by Prevost Hubbard, Chemical Engineer, The Asphalt Institute, New York.

December 14, "Labor Restrictions and Bidding" by Arthur A. Johnson, President, The Arthur A. Johnson Co., Queens.

December 21, "Engineering and Contracting in Preparation for a World's Fair," by Col. John P. Hogan, Acting Director, New York World's Fair.

January 4, "Sub-bidding and the Use of Marble in Construction," by James Sciacchitano, marble contractor, the Bronx.

The speaker for the January 11 lecture has not been announced as yet.

Cerro Gordo Played Safe; Ordered Snow Plows Early

To the Editor
Contractors and Engineers Monthly

In reply to your editorial "Snow Plows Aren't Made in a Minute" in the September issue of CONTRACTORS AND ENGINEERS MONTHLY, I should like to add that Cerro Gordo County, Iowa, placed an order for three trucks and snow plows last April. The complete outfits were delivered the latter part of September.

C. R. Patton,
Chairman, Board of Supervisors,
Cerro Gordo County, Iowa.

Editor's Note: This is further evidence of the necessity of placing orders for needed snow fighting equipment far in advance. We only hope that many other county and state highway departments were as fore-sighted as the Board of Supervisors of Cerro Gordo County, and are now prepared to meet the heavy snow storms which may begin almost any time.

A world's record for dredging was made at Cochin in 1928 when a channel 2 miles long and 450 feet wide was dug in four weeks as part of the harbor undertaking which now has made Cochin a leading modern deep-sea harbor. All but four of the engineers in charge were native to India.—*World in Brief.*

Courtesy, Rockefeller Center Weekly

"It's a Fan Letter!"

ARBA Names Committees For Highway Safety

In the most intensive program ever undertaken in this country to strike at the root of highway accident causes, the American Road Builders' Association has announced that more than 100 highway engineers and officials, including members of the Federal Government, have been organized to assist its nation-wide membership of 4,600 individuals and institutions in striving for a final solution of the motor vehicle casualties problem.

Under a Committee on Safe Highways, of which Dr. H. E. Tabler, Chairman, Maryland State Road Commission, is Chairman, and including as honorary members the Governors of twenty-six states, and an advisory group composed of representatives of sixteen national organizations, a closely integrated group of special problem committees, engineering and technical committees will make a searching analysis of the causes of accidents on American roads and highways and submit recommendations for their elimination.

The first reports of the problem committees will be made at the annual convention of the American Road Builders' Association, to take place in New Orleans January 11-15, 1937.

These working units of the safe highways committee are as follows: Committee on Highway Illumination, Michael A. Connor, Commissioner of Motor Vehicles for the State of Connecticut, Chairman; Committee on Roadway Surfacing, Professor R. A. Moyer, Iowa State College, Chairman; Committee on Alignment and Grade, R. Getty Browning, Senior Locating and Claim Engineer, North Carolina State Highway Department, Chairman; Committee on Cross Sections and Roadside Development, M. W. Torkelson, Director of Regional Planning, Wisconsin State Planning Board, Chairman.

Several other problem committees are being organized, including a Committee on Highway Intersections and Grade Elimination, Committee on Signs, Signals and Marking, and a Committee on Analysis of Accident Data, the membership of which it is expected will be announced at an early date.

Diverting the Columbia

The next step in the construction of Grand Coulee Dam on the Columbia River, Washington, is the diversion of the River from its course, guiding it around a cofferdam and into a new man-made channel 200 feet to the west.

Two cofferdams, one upstream and one down, will make dry an 800-foot section of the river bed. Between these and across the river, the giant foundations of the permanent dam must be built between the times of winter surges of ice and the highwater floods of the summer.

Five thousand men are now rushing the preliminary steps for this work.

Draining Swamp Land With Vertical Drains

California Experiments With Columns of Gravel and Laterals in Muck Beneath Heavy Fills

AN interesting experiment is now under way at El Cerrito north of Oakland, Calif., on a section of the approach highway to the new San Francisco-Oakland Bay Bridge. The underlying ground is a swamp and consequently unstable for the foundation of a fill which must be placed to carry the highway at the proper grade. The Testing Laboratory of the California Division of Highways has formulated a theory that the swamp can be drained as the fill is placed if suitable channels for the water are created before the fill is spread.

These channels consist of wells cut in the muck with a special rig and filled with gravel and then main drains and laterals along the ground surface composed of crushed stone and leading to the outside of the fill.

The laboratory studies of construction over marsh land indicate that the weight of a fill produces a water pressure in the saturated foundation which causes lateral displacement and slow subsidence as the excess moisture is eliminated. The scheme is to provide sufficient vertical drains in the muck to release readily the excess moisture and relieve this water pressure, thus stabilizing the roadway during a relatively short stage construction period. The vertical drains provide an outlet for horizontal flow of water through the mud strata and are spaced in a manner to reduce greatly the normal resistance of the foundation to the elimination of excess moisture.

As with any new idea, there is a difference of opinion as to the possible success of this method of stabilizing muck and peat. The Testing Laboratory feels certain of its success but some construction men see the possibility of side slippage of the columns of gravel which will prevent their functioning as drains. Further there may be a filling in of the drains with muck that will choke them so that water cannot escape.

Boring for the Piles

The "vertical drains" or "sand piles" are made by boring an 24-inch hole with a special rig developed for this purpose. In some holes where the material is very unstable a casing has been driven as the hole was bored but in most of the holes the material has stood up long enough to permit the placing of the gravel. The holes are tested as soon as they are completed to determine whether the material is reasonably stable by inserting a pair of 1 x 2-inch sticks into the hole. This pair of sticks is held parallel by another short pair of equal-length bars nailed at about the mid section. The long sticks inserted into the hole can be pulled apart to show that the hole is clear, or if it is filling in, the reduced cross section is shown by the closing of the sticks.

The Boring Rig

The 24-inch holes are bored with a 20-inch diameter cutter bucket with blades set to ream a 24-inch hole, mounted on a 30-foot shaft which is turned by a 36-inch pinion driven through gearing by a LeRoi engine. The boom which handles the drill is 30 feet high and folds down on the Ford truck for traveling. A clutch controls the operation of the cutter head. The holes for the vertical drains are bored at the rate of 20 feet an hour.

The holes are placed on 10-foot centers completely covering the ground area of the fill. Alternate rows 10 feet apart are staggered. The holes are bored down 30 feet to a layer of impervious clay through a shallow layer of peat at the top, then muck and at a depth of about 12 feet there is another layer of peat showing the subsidence of the coast line.

Where the very soft material has been encountered and the casings have been used they have been pulled as the hole was filled with gravel, using a gin pole. It was found, however, that the use of casing could usually be eliminated by filling the hole with water during drilling. The water furnished sufficient pressure against the side walls to hold the hole open until it could be backfilled.

The material used for the piles is a ¾-inch maximum size pea gravel containing 10 to 30 per cent of sand passing a 10-mesh sieve which was purposely included to act as a filter and to prevent mud from flowing into the vertical drains.

C. & E. M. Photo

Longitudinal Drains of Crushed Stone Over the Vertical Sand Drains

The Laterals

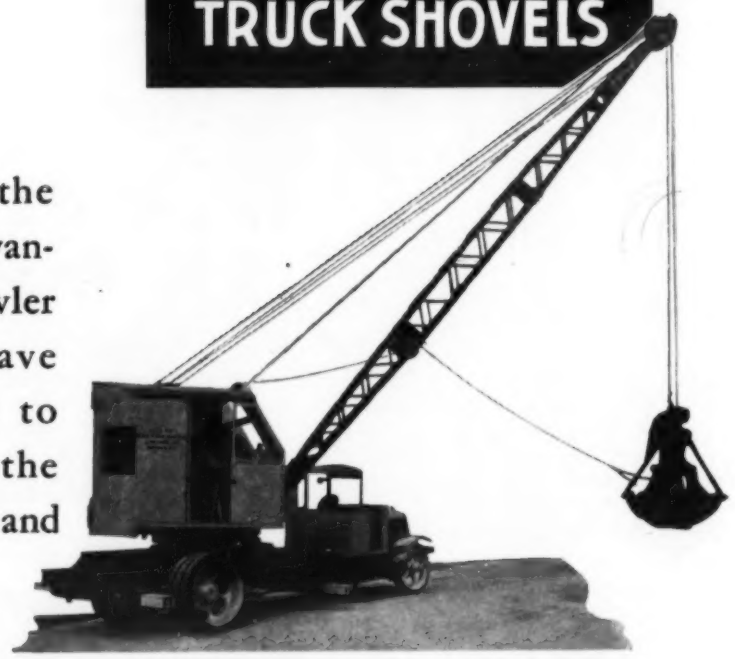
To form the connections to drain the water from the sand piles 1 x 12-inch planks are set on edge 12 inches apart along the line of the piles and the space

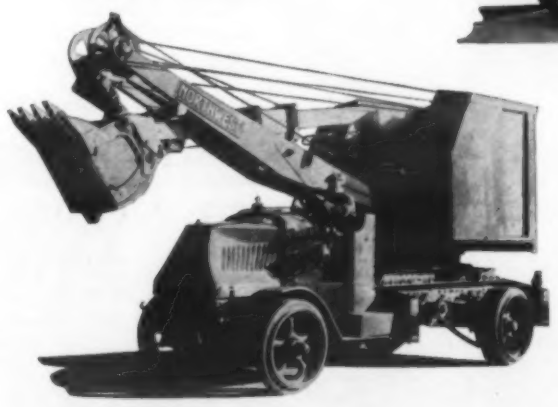
(Continued on page 26)

NORTHWEST ANNOUNCES

A Complete line of TRUCK CRANES and TRUCK SHOVELS

FOR the first time the many exclusive advantages of Northwest crawler cranes and shovels have been made available to truck crane users in the Northwest Truck Crane and Truck Shovel.





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Floodlighting World's Fair Site

Need for Speed in Preparation Of Site for 1939 World's Fair in New York and Size of Area Requires Special Floodlighting

ONE of the world's largest floodlighting installations is now doing duty on the future site of the 1939 World's Fair between Flushing and Corona, L. I., New York. The site covers 1,216 acres and gives to New York City one of its largest park areas. The design of the fair construction will be with a view to preserving its natural beauty while adding improvements which will remain after the fair.

For many years, this area has been used as a dump, with the refuse piled in large hills, several of which were 50 to 60 feet high. The work of the contractors, the Arthur A. Johnson Corp.-Necaro Co., Inc., consists of leveling this area by removing and refilling from 7,000,000 to 8,000,000 cubic yards of material. Extreme care must be taken in relocating this material in low spots, due to the possibilities of mud waves caused by sudden weight in a particular area. The contract calls for completion of the work April 1, 1937, which means that 30 cubic yards of material must be moved every minute of time between June, 1936, and April, 1937.

Work is now going on at top speed, in three shifts. In order to maintain a uniform rate of production night and day, a floodlighting system had to be designed which would provide an even intensity of light over the entire area of 1,080 acres.

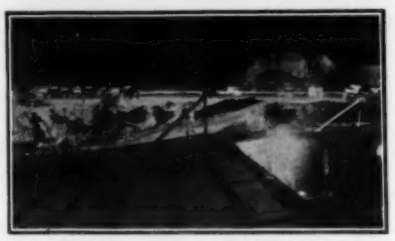
Tests of Lights Conducted

The Lighting Bureau of the New York and Queens Electric Light & Power Co., working in conjunction with the Commercial Engineering Bureau and the Arthur A. Johnson Corp.-Necaro Co., Inc., conducted an intensive study of the situation and prepared the following specifications: 1. weather-proof unit; 2. beam not to exceed 25 degrees; 3. standard PS lamps to be used; 4. trunnion or equal suspension; 5. materials of manufacture to be such as to resist salt air.

Because of the long throw required and the resultant narrow beam necessary for this long throw, none of the standard manufactured units were suitable so floodlighting manufacturers were requested to submit samples prepared on the specifications. Competitive tests were conducted on the roof of the New York and Queens Electric Light & Power Co.'s general office building in Long Island City in the presence of Arthur A. Johnson Corp.-Necaro Co., Inc., officials and illuminating engineers.

The Installation

The floodlights chosen for the installation are manufactured by the Westinghouse Electric & Mfg. Co. The reflector is composed of heavy sheet steel, shaped to utilize the maximum output of the lamp. It is coated clear porcelain enamel outside, white porcelain inside,



Floodlighting at the World's Fair Site Makes Possible Excavation By Night As Well As By Day

with an auxiliary specular Alzak reflector, designed to throw a beam of 20 degrees. The reflector in each case is detachable from the socket housing and mounting brackets assembly, making installation, wiring, and maintenance comparatively simple. Each unit has a diameter of 25⅜ inches and is 24½ inches high, including the bracket. The complete installation covers approximately 500 kilowatts or 345 floodlighting units, each using a 1,500-watt 120-volt PS-52 clear Mazda lamp.

The following table lists the floodlighting station numbers together with the number of units and the load per location.

Station Number	Number of Units	Kilowatts
1	27	40
2	49	72
3	32	48
4	30	45
5	16	24
6	16	24
7	32	48
8	24	36
9	24	36
10	18	27
11	27	40
12	40	60

The installation was laid out for the delivery of ¼ or ½-foot candle average over the entire work area. Only extremely rough seeing tasks are necessary for this type of work and lighting is required merely for truck drivers to see the spot in which they are to dump their fill. Each individual drive-line machine and shovel has its own local lighting equipment attached to and made a permanent part of its structure, so that local lighting is provided for all types of excavating.

The general floodlighting then is necessary only for providing the necessary

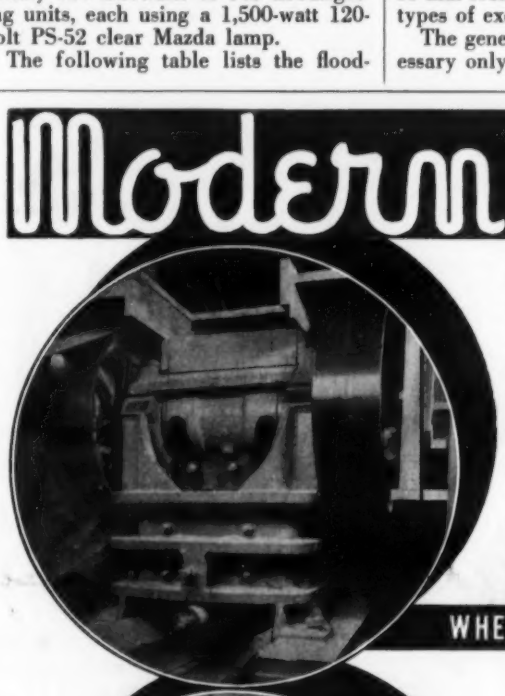
Close-Up of the Floodlight Tower Showing Arrangement of Floodlights

seeing conditions to relocate the material for leveling off the entire area. In some cases, the units must provide seeing conditions at a distance 2,000 to 2,500 feet away from the floodlighting station.

New Okla. Distributor For Hercules Rollers

The Hercules Co., Marion, Ohio, has announced the appointment of the Wylie-Stewart Machinery Co., Oklahoma City, Okla., as distributor for the complete line of Hercules rollers, including the Hercules Ironer Roll, in the state of Oklahoma. Wylie-Stewart offers a state-wide coverage for both sales and service.

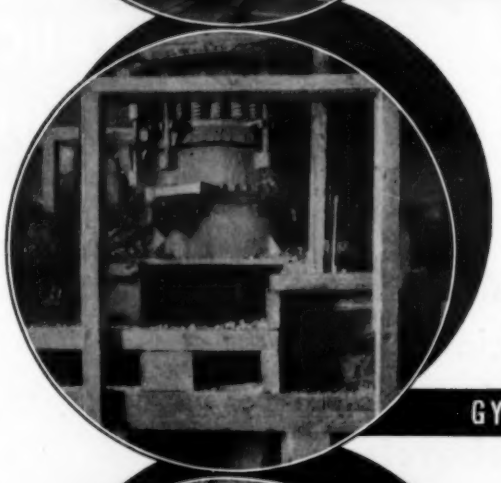
Modern IN EVERY SENSE OF THE WORD



To meet today's demands, Telsmith has built greater speed, larger capacity and lower upkeep into this three-piece combination of thoroughly modern equipment.

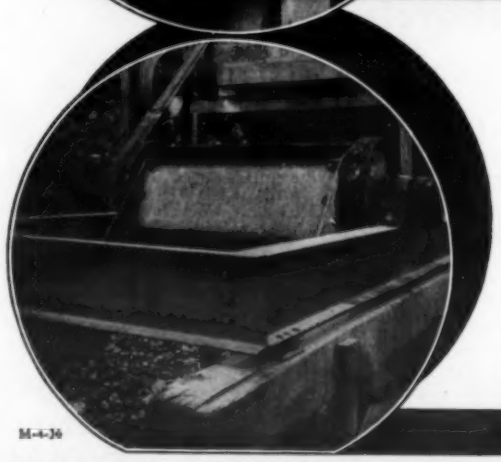
● **The Telsmith-Wheeling Jaw Crusher gives greater reduction in one process than any other type of breaker. Cylindrical roller bearings, force feed, and high speed almost double capacity. Both massive frame and swinging jaw are annealed cast steel; jaw dies are manganese steel. Simple adjustment allows wide sizing range. Upkeep is reduced to a minimum. Six sizes to meet every need.** ***Write for Bulletin W-34.***

WHEELING JAW CRUSHER—FOR COARSE CRUSHING



● **The Telsmith Gyrasphere gives you trouble-free secondary crushing...greater tonnage...a finer, more cubical product...more years of low up-keep service. Takes an unlimited choke feed. Only a Telsmith Gyrasphere Crusher has the** ***double-wedge crushing action*****, the most effective crushing action developed in any crushing device...and** ***double protectors*** **(both labyrinth seals and piston rings) to reduce both oil consumption and maintenance expense to a minimum.** ***Write for Bulletin Y-34.***

GYRASPHERE CRUSHER—FOR FINER CRUSHING



● **A better built, heavy-duty vibrating screen — the Telsmith Pulsator screens sand, gravel, crushed rock, ore, or coal...wet or dry. Its circular movement produces a maximum screening action...uniform on every inch of the wire...on every deck...under any load. Greater value, longer life and lower up-keep are built in — with the toughest alloy steels, the finest anti-friction bearings, and special labyrinth, piston ring seals for the protection of working parts.** ***Write for Bulletin V-34.***

M-4-36

PULSATOR—FOR EFFICIENT SCREENING

SMITH ENGINEERING WORKS, 4014 N. HOLTON STREET, MILWAUKEE, WIS.

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New Vehicular Tunnel Under East River, N. Y.

New York City's new East River Vehicular Tunnel, connecting the boroughs of Manhattan and Queens, for which ground was broken on October 2 by President Roosevelt, is the largest single non-federal undertaking by the PWA, which has made a loan of $47,130,000 and a grant of $11,235,000 for its construction. This new twin-tube tunnel is designed to aid in the solution of New York City's perennial traffic problem by relieving the congestion on the four East River bridges.

Thirty-eight hundred vehicles an hour will move through the two tubes of this tunnel upon completion. Providing double traffic lanes in each direction, the tunnels will be 7,790 feet long, 2,500 feet less between portals than the Holland Tunnel. Each tube will be 31 feet in diameter, with a 21-foot roadway and service walk, and a clear headroom of 13½ feet.

On the Manhattan side, the entrance plaza for incoming traffic will be located near 36th Street between Second and Third Avenues. New streets will be laid out at each plaza to expedite distribution of traffic to cross streets and thus avoid concentration on any single thoroughfare. On the Queens side, the tunnel portal will be at Borden and Jackson Avenue where the toll collection booths will be located.

The tunnel has been designed with New York City's future traffic needs in mind. Already under consideration by local officials is a cross-town vehicular subway to link it with the Mid-Town Hudson Tunnel, another PWA project being built under the direction of the Port of New York Authority which is nearing completion and which will connect Manhattan and New Jersey.

New 10-Yard Wagon Scraper

A 10-yard wagon-scraper, known as Model CS10A, of the full-carrying tractor type, identical in design and appearance with the Continental 5 and 7-yard models and embodying the same general operating features, has been announced by the Tractor Equipment Division of the Continental Roll & Steel Foundry Co., East Chicago, Ind. This new model, built for use with 75-hp and larger tractors, is especially designed for digging, loading, hauling and dumping tough clays and gumbo soils, shales, hard pan and rocky soil as well as the loams, sandy clays and similar material.

This wagon-scraper is ruggedly constructed throughout of heat-treated alloy steel castings, with alloy heat-treated

One of the Continental CS10A 10-Yard Wagon Scrapers

shafts. The digging bucket, front apron and rear dump door are fabricated of special steel plate, arc welded. The overall length of the unit is 16 feet 9 inches, its width 11 feet 9½ inches, and height, 6 feet 9 inches.

The hydraulic power control unit furnished with this wagon-scraper consists of a new heavy-duty hydraulic pump, a free working control valve and rear type control lever, allowing fingertip control by the tractor operator.

A descriptive folder on this new wagon-scraper may be secured upon request direct from the manufacturer by mentioning this magazine.

New Heavy-Duty Shovel For Tractor-Mounting

The new Hough heavy-duty hydraulic tractor shovel, recently announced by the Frank G. Hough Co., 919 No. Michigan Ave., Chicago, Ill., has been built especially for the special Allis-Chalmers Model WM tractor. Through cooperation with Allis-Chalmers engineers, the tractor and shovel have been engineered as one complete unit, particularly adaptable to use by contractors, and state, county and township highway engineers.

The shovel has a ½-yard bucket and will dig any solid dirt or clay and raise the load sufficiently to dump 7 feet from the ground. It is claimed that 30 to 40 yards an hour can be dug and loaded and that up to 50 yards of sand, stone or similar material can be loaded into trucks from stockpiles.

The complete assembled unit is shipped, ready for operation, from the Allis-Chalmers plant at Springfield, Ill.

The Hough Heavy-Duty Hydraulic Tractor Shovel Mounted on an Allis-Chalmers Model WM Tractor

Boston Representative of Smith Engg. Moves Office

Announcement has been made that the Anderson Engineering Co., Boston representative of the Smith Engineering Works of Milwaukee, Wis., has moved its offices from the Statler Building, Boston, to 81-83 Binney Street, Cambridge, Mass.

A Type and Size of Bucket for Every Need

Power-Arm Power-Wheel Multiple-Rope Dragline

Built to DIG and last while digging. BIGGER PAY-LOADS are doubly sure. Write for bulletins.

THE WELLMAN ENGINEERING CO.
7012 Central Ave., Cleveland, Ohio

WILLIAMS BUCKETS

AGAIN ON THE GREATEST BRIDGE OF 1936 IT PAID to Forget the OLD STUFF

At pouring time, Rex Moto-Mixers, loaded at the mixing plant, three-quarters of a mile away, are feeding concrete into the Pumpcrete hoppers.

The Pumpcrete pipe line, supported by a light steel truss, extended over the water 350 feet, to carry the pumped concrete into position for placing.

The Pumpcrete delivering the concrete to a floor hopper on a barge anchored near the pier forms. There, a crane and bucket completed the pouring into the forms.

● Concreting of the piers, in Little Hell Gate's rushing waters with tidal currents and flood waters to combat, presented one of the most interesting, difficult and spectacular feats in the construction of the famous Triborough Bridge in New York.

Old-time methods went into the discard with the installation of a Rex Dual Pumpcrete on the banks of Little Hell Gate.

● In concreting the deck of the Manhattan Approach, a Rex Pumpcrete, located at the foot of one of the piers, and fed by four Rex Moto-Mixers, pumped the concrete up to the deck, in one day pumping 728 cubic yards of concrete for an average of 47.73 yards per hour.

On Randall's Island, three Rex Moto-Mixers mixed and delivered 360 cubic yards of concrete to twelve scattered piers in ten hours.

In the construction of this $60,300,000.00 bridge, opened to traffic on July 11, Rex Moto-Mixers also mixed and delivered concrete for the following important contracts: the Land Piers on Ward's Island, the Multi-ramped Traffic Sorter on Randall's Island and the Landscaping of the Manhattan Approach.

CHAIN BELT COMPANY
1666 West Bruce St. Milwaukee, Wis.

Concrete by Pipe Line with REX PUMPCRETE

N. Y. Sewer Tunnel Built Under Air

Rodgers & Hagerty, Inc. Blow Concrete to Forms, Using Varied Devices for Bronx Sewer

"EAST is East and West is West and never the twain shall meet" was not written to describe a sewer contract in New York City but it fits like Cinderella's slipper. When the Department of Sanitation called for bids on various sections of the Manhattan and Bronx Intercepting Sewers, Contract 10 was for sixty regulators scattered over the entire project from 73rd Street in Manhattan to 138th Street in the Bronx. The regulator chamber at the junction of Brook Avenue and 133rd Street, or Southern Boulevard, in the Bronx divides two portions of a sewer contract awarded to Rodgers & Hagerty, Inc., running east and west from that point. Nature also had a hand in this division, for the sewer running eastward is in sand and clay, requiring a tunnel operation in air, while the section running to the west is in solid rock. This article will describe the tunnel in air and a later article will be devoted to the rock tunnel.

The Shaft

Excavation for the 40 x 18-foot shaft through sand mixed with clay required steel sheeting at the end, because of a sewer at a depth of 20 feet in Brook Avenue, and 14 x 10-inch, 61-pound H-beam soldiers driven 8 feet on centers for the remainder of the shaft. Using 24-inch 133-pound I-beams as rangers, horizontal sheeting of 3 x 12-inch planks was placed behind the outer flange of the H-beam for a depth of about 18 feet, where the first Moretrench wellpoints were driven on 3-foot centers, the 6-inch header being carried on the rangers. The horizontal sheeting from the wellpoint header down was placed at the back of the front flange of the H-beam. Excavation in the shaft was handled with Williams and Owen 1¼-yard clamshell buckets and Lima 101 gas-engine-powered cranes. At a point about half way down the 39-foot shaft a Complete sump pump was installed as an emergency unit in case of flooding. At the bottom of the shaft to which the tunnel drained, a LaBour 4-inch sump pump with an electric drive was installed.

Air Locks

The air pressure required in the 810-foot tunnel section ranged from 2 to 17 pounds as the uneven material varied from sand to soft rock through boulders and clay, a condition which slowed progress, making 8 feet in 24 hours an average advance.

The horizontal lock which handled two muck cars and which served both as a man-lock and material-lock was 30 feet long with an inside diameter of 9 feet and carried a single track. Since in most cases no men passed through the lock when material was being delivered to free air, it was possible for the Whitcomb electric battery locomotive handling one car to deliver it to the heading where men loaded it in 5 minutes, haul it out, take it through the lock, have the bucket raised to the surface and returned through the lock into air again and be back at the heading inside of 11 minutes. The 1½-yard skips were lifted from the Koppel cars to the top and dumped into the Mack trucks by one of the contractor's Lima 101 cranes.

Compressor House

A 30 x 70-foot corrugated metal compressor house located on Brook Avenue close to the shafts supplied low pressure air for the operation to the east and high pressure air for rock drilling in the tunnel running west.

The low air equipment consisted of an Ingersoll-Rand ERI 1,100-foot compressor driven by a 100-hp G-E motor; an I-R Imperial Type No. 10 1,600-foot compressor driven by a 125-hp G-E motor operating at 40 pounds pressure, and for high air three portable compressors mounted on temporary timber foundations as follows: an I-R Model 315 air-cooled compressor, an I-R 310 gas-powered compressor and another I-R 450-foot compressor, all operating at 100 pounds capacity.

Mucking the Tunnel

The tunnel labor organization consisted of miners, helpers, muckers, one inside and one outside lock man and one locomotive operator for each shift. The men worked three hours in air and had three hours off, in compliance with state regulations, while those in free air worked a full 6-hour shift.

Two-inch horizontal planking was used for breast boards and the muckers were able to load a car in about five minutes, working in the type of material encountered. The crew then placed the Commercial Shearing & Stamping Co. liner plates measuring 16 x 37 x 7/16 inches. The same crew also handled the 30-foot needle beam Blaw-Knox steel form and traveler and placed the reinforcement and the concrete.

Steel Forms

The concreting procedure in this 10-foot 6-inch x 12-foot 4-inch horseshoe sewer was first to concrete the invert and 8 inches of the wall and then the top or arch. The concrete averaged 15 inches thick.

The 17-foot Blaw-Knox steel form for the upper section of the sewer was mounted on a traveler running on 40-pound rail. The 15-foot arch section

(Continued on page 29)

GRADING COUNTY ROAD

An Austin-Western Hand-Controlled Blade Grader Developing a County Road 3 Miles Outside the Town of St. Mary's, W. Va.

KOEHRING

Two new KOEHRING *Long Range* DRAGLINE models for large drainage projects, extensive stripping areas in mines and quarries and wide canal excavation. The 702 and 802 are especially designed for a long and wide range of operating flexibility. High speed further enables these machines to greatly increase production every day.

Know more about these Long Range Draglines!

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Coulee Landslide Stopped By Freezing

By HENRY W. YOUNG

Unique Cooling System To Freeze Slippery Clay At East Abutment Tried By Reclamation Engrs.

JUST as there are conditions and problems arising at Grand Coulee never before encountered in engineering and construction practice, so are methods being employed there that are so original and spectacular in conception and execution that the observer is left almost in a daze. The latest thing that they are doing of this nature is to freeze the toes of a landslide. Twenty thousand dollars has been spent by the Bureau of Reclamation on a refrigeration plant and equipment. At a point where a few short months ago there was an irresistible, slowly moving mass of slippery clay there is now a dam of ice and frozen mud that has stopped the flow. While the plan is more or less of an experiment, not without its hazards, to date it seems to be developing in nice shape. The dam is frozen, but it has not as yet been put to the maximum compression test, and therein lies the question that the next few months will answer.

To understand what it is all about, it is necessary to go back into the construction history of the east side abutment area. Core drill tests showed that deep under this area was a crevasse, supposedly a continuation of Rattlesnake Canyon on the other side of the river. When rock excavation began, it was found as predicted. In order to secure suitable foundation rock for the abutment at this point, it was then necessary to clean out the crevasse down 100 feet below the rest of the area. This deep cavity, narrowing toward the bottom, has an area at the top of about one-half acre.

To the south of the abutment was a hillside of clay of a very slippery character when wet, with almost no rock or gravel in it. In order to uncover the rock of the abutment area, this clay hillside had been excavated and sloped back until the upper edge was nearly a quarter of a mile from the point where the crevasse excavation began. When the crevasse had been excavated and the high water period of the spring of 1936 came along, the whole east side abutment area was flooded to a point well up on the sides of this slope of clay.

As the clay became impregnated with moisture it began to slide down into the cavity. Some 200,000 cubic yards of it began to move in a fan-shaped mass. The mass converged to a width of approximately 170 feet at the point where it crept into the excavation.

At first an attempt was made to excavate it as it came down. But the flow was not retarded. Next an arc-shaped concrete retaining wall was built at the point where the slide was emptying into the crevasse. But this did not prove effective. It was topped and on came the mud. Finally, it was decided to freeze the mass and stop the flow until the crevasse could be concreted and concrete for the east end of the dam placed to a height necessary to hold the bank.

Summed up in a few words, the procedure was to drive a series of vertical pipes on 30-inch centers in an arc-shaped formation clear across the toe of the slide, like a series of piles. These were placed in the arc of a circle of 105-foot radius and located above the concrete retaining wall and between it and the body of the slide. The pipes were also driven well below the level of the top of this wall.

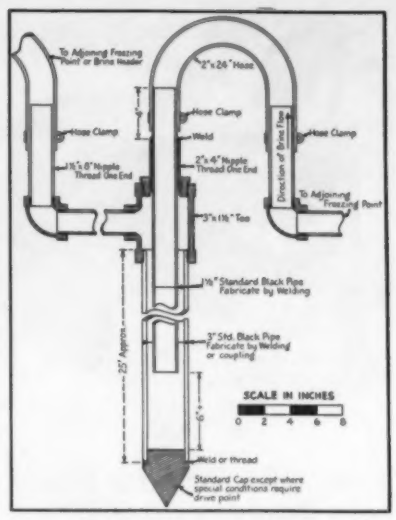
Inserted in these pipes were others of smaller diameter, extending to near the bottom and connected to the feeder and return of a large refrigeration plant. Cold brine pumped into the inner pipes would thus flow down to the bottom and then upward through the space between the inner and outer pipes and would then cool the surrounding soil to the freezing point and solidify it into a frozen mass which would not flow.

Details of Piping System

Arrangement of the cooling pipes at the toe of the slide is shown in the diagram on page 31. In the arc there are ten groups of 16 each, driven on 30-inch centers each way. In addition, there are clusters of approximately 50 additional pipes driven at each end for strengthening, as well as approximately 50 more spaced outside the main arc. The total number of pipes is, therefore, over 300.

The outer pipes are 3 inches in diameter, each in two lengths, the upper length being threaded to the lower one after the latter had been driven. To the lower end of the bottom pipe was screwed a pointed cap.

At the top of the 3-inch outer pipe is a standard 3 x 1½-inch tee for admitting the smaller pipe at the top and for returning the brine to the return system at the side opening of the tee. The inner pipe is standard black pipe 1½ inches in diameter. It is admitted to the outer pipe through the top of the tee by means of a sleeve welded on and threaded at the lower end to engage a 3 x 3-inch shoulder bushing fitting into the tee. The brine passes out through the side opening of the tee to a short horizontal pipe threaded into the tee and carrying a threaded elbow on the outer end to which is connected a 1½ x 8-inch vertical nipple provided with a connection for a hose clamp.


To Adjoining Freezing Point or Brine Header
2" x 26" Hose
Hose Clamp
Hose Clamp
Hose Clamp
Weld
2" x 4" Nipple Threaded One End
1½" x 8" Nipple Threaded One End
Direction of Brine Flow
To Adjoining Freezing Point
3" x 1½" Tee
1½" Standard Black Pipe Fabricate by Welding
3" Std. Black Pipe Fabricate by Welding or coupling
25' Approx.
SCALE IN INCHES
0 2 4 6 8
Weld or thread
Standard Cap except where special conditions require drive point

Detail of Freezing Point

Driving and Assembling Pipes

The average depth to which the pipes were driven was approximately 43 feet. The points were not carried down to bed rock but to a point 15 feet below the top of the retaining wall. Two methods of driving were employed. One was a Keystone well drilling rig, gas-driven and having a 600-pound hammer. The other was a combination diamond drill and standpipe rig with a 400-pound hammer operated from a barge on the water which had accumulated in the excavation.

The 3-inch outer pipe came in lengths that necessitated coupling two pieces together to get the desired depth. The first length was capped and driven and the next length threaded on. The upper end of this was also capped and when the two had been driven to the proper depth, the driving cap was taken off, the upper end rethreaded if necessary and the tee attached. The threading and rethreading was done by means of a Toledo No. 2 thread cutting die. The hose for connecting the pipes in series was 3-ply, Style W-70 Goodyear water hose.

Connecting the Pipes

The freezing pipes are connected together in series in groups of 16, by means of short pieces of water hose from 2 to 3 feet in length in the shape of U's. They are each coupled at one end to the nipple delivering the brine from the tee and at the other to the upper end of the inner pipe delivering brine to the next in series.

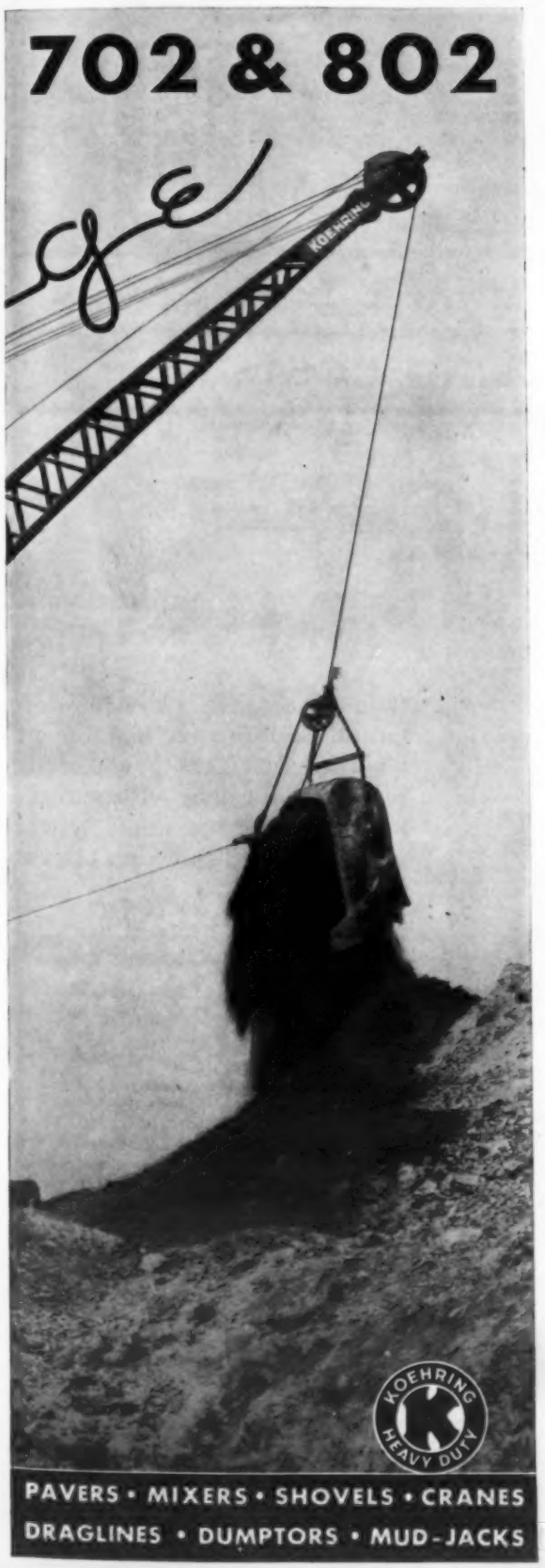
Along the outer circumference of the arc-shaped group of pipes is a horizontal feeder pipe coming from the refrigeration plant. Each of the groups of 16 freezing pipes is connected to this header with a U hose and through a 1½-inch Crane No. 440 gate valve. Thus, brine is admitted or cut off from any group of 16 at will, or the rate of flow balanced between groups.

Along the inner circumference of the arc is the common return pipe leading to the refrigeration system. When the whole system was in place, the feeder pipe coming down from the refrigeration plant, located on a ledge about 50 feet above, was surrounded with a trough and insulated, and sawdust was also piled on the exposed ends of the freezing pipes to insulate them.

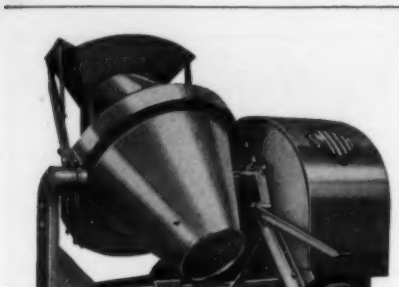
Refrigeration Plant

The plant is housed in a building open on the sides and located on a ledge approximately 50 feet above the tops of the freezing pipes. Used machinery was installed. There are two ammonia compressors; one Baker ice machine and one Frick machine. The former is belt driven by a G-E 60-hp induction motor with Baker ball-bearing idler. The latter is driven by an Allis-Chalmers 50-hp induction motor by means of a belt without idler. Both machines are 9 x 9, of 80 tons capacity combined. They are so connected to the system as to be operated either singly or in parallel. A

(Continued on page 31)



Ask for the New Long Range bulletin



One of the New Smith 3½-S Tilting Concrete Mixers

New ½-Bag Trailer Mixer Like Boulder Dam Tilters

The general design of the big Smith 112-S tilting mixers used at Boulder Dam has been incorporated into the new ½-bag mixer recently announced by the T. L. Smith Co., 2835 N. 32nd St., Milwaukee, Wis., concrete mixer manufacturer since 1900.

The unit is equipped with spring-mounted axle, Hyatt roller bearings and pneumatic or cushion rubber-tired wheels. The charging height is unusually low, only 34½ inches. The drum may be charged directly through the 15-inch drum opening, which is in a vertical plane, or through a 31-inch wide feed chute available as extra equipment. To discharge the concrete, the drum moves through a short 40-degree arc.

Power is supplied by a 2 to 2½-hp Stover enclosed crankcase engine, with oil bath lubrication and magneto. The drive to the mixer is through a machine cut gear and pinion. Both gears and engine are enclosed in a lockable steel house.

Flexible Shaft Equipment For Concrete Finishing

New flexible shaft equipment, recommended for grinding and grouting operations on bridges, culverts and similar large concrete surfaces, has been announced by R. G. Haskins Co., 4636 W. Fulton St., Chicago, Ill.

It consists of a 7-foot heavy-duty flexible shaft, the casing being equipped with patented Haskins removable ends, driven by a full ½-hp air-jacket totally-enclosed motor, operating at 1,725 rpm. A ball-bearing grease-sealed 3 to 1 reduction right-angle head provides for the use of a 5½-inch cup wheel, two of which are furnished with each unit.

For safe handling on scaffolds, etc., the equipment is mounted on a flat base of Met-L-Wood construction, equipped with four metal bosses to facilitate sliding.

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New 6-Cylinder Diesel Can Be Cranked by Hand

A feature of the new International PD-80 diesel power unit, recently announced by the International Harvester Co., Inc., 606 So. Michigan Ave., Chicago, Ill., is that the economies of full-diesel power are combined with the International diesel starting system which converts the engine into a conventional gasoline engine for starting. This new diesel is a 6-cylinder engine and, like the 4-cylinder Model PD-40, can be started by cranking as readily as a gasoline engine of corresponding size, according to the manufacturer.

The essential parts of the engine, cylinders, pistons, crankshaft, manifolding and cooling and lubricating systems, are common to both starting and diesel operation. After a minute or so of gasoline operation, a quarter turn of a small crank reduces the compression chamber to the size for diesel operation, shuts off the gasoline, and starts the diesel fuel injection, enabling the engine to operate on a small quantity of low-priced fuel without the use of a carburetor, magneto, or spark plugs. Even in the coldest weather, it is claimed that the engine parts are thoroughly warmed during this starting period, assuring full heat from compression to give a quick diesel start.

The PD-80 embodies throughout its construction the International Harvester features of balanced engine construction. The 7-bearing crankshaft is of special chrome-molybdenum steel, drop-forged and electrically heat-treated. The seven main bearings and the connecting rod bearings are steel-backed and copper-lead lined, of the precision type and replaceable. The connecting rods are drop-forged I-sections with bearings 2 inches wide. The crankshaft bearings are lubricated through drilled passages in the crankshaft and the piston pin bearings through drilled passages in the connecting rods.

Regular equipment includes fuel injection pump, fuel supply pump, fly-ball governor, fuel filters, full-pressure lubrication with gear-driven oil pump and double capacity metal oil filter with oil pressure regulating valve, International carburetor and magneto with automatic impulse starter coupling for starting purposes only, exhaust pipe and mounting angles.

Further information on this new power unit is contained in a new bulletin which may be secured on request direct from the manufacturer by mentioning this magazine.

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THE NEW CLEVELAND SINKER THAT SAVES
MONEY ON DRILLING COSTS

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LEADERS IN DRILLING EQUIPMENT

Heavy-Duty Snow Plows Used on Motor Graders

With the idea of making a motor grader a piece of road machinery for service throughout the year, J. D. Adams Co., Indianapolis, Ind., has developed the Adams No. 5 snow plow for mounting on motor graders. This plow is of large capacity and its design is said to permit it to go through snow with such ease that no more power is required than with some smaller plows.

The flat nose gives the snow a flying start up the plow moldboard, the curvature of which lifts it as much as 5 feet to throw it well out to either side of the road. This high lift means that the snow is not simply pushed sideways as with a wedge action, but it is lifted and thrown out over the top of the surrounding snow even though the piles may be quite deep.

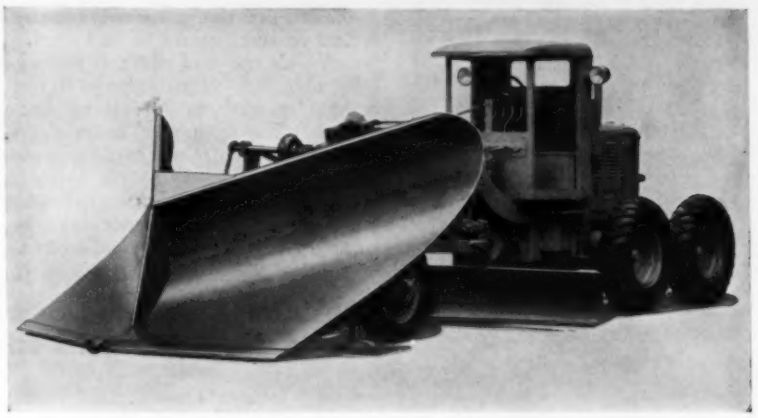
The upright lifting frame for the plow has its main support on a special shaft which runs through the scarifier shaft brackets. It is supported at the top by angle braces bolted at the scarifier lift bracket holes on Adams graders Nos. 50 and 51 and to special clamp castings which fasten on the frame members on other models. The bottom of the upright is supported against horizontal load by the bolster block on the front of the grader.

The V plow is strongly cross-braced by two heavy angles and large vertical gusset plates, giving an angle of 80 degrees between the two moldboards. The lower portion of the moldboard across the nose and up the sides is strongly reinforced underneath by plates welded in a box-like formation. The plow rides on three easily adjusted shoes and has a parallel lift which provides ample clearance for passing over bridges and railroads. The plow makes a cut 9 feet wide across the nose and 12 feet wide across the rear. The plow is 3 feet 6 inches high in front and 6 feet 6 inches high at the rear and may be lifted 14 inches for ground clearance.

New Drafting Machines Have Unusual Features

The new Bruning Drafters, including new models of the Standard Drafter, the Civil Engineers' Drafter and the De Luxe Civil Engineers' Drafter, which have recently been announced by the Charles Bruning Co., Inc., 102 Reade St., New York City, have a number of features which, according to the manufacturer, result in a 25 to 40 per cent saving in drafting time.

Each of the new machines is equipped with an adjustable brake mechanism to prevent the protractor head from sliding excessively when used on an inclined board. Each machine also has adjustable skid buttons for leveling the scales. Pulleys are fully enclosed, and bands may be changed if necessary, without disassembling the machine. Each machine is equipped with New Departure precision fully-enclosed ball bearings, lubricated for life, while another feature is the elbow leveling device. All parts are of dull finish aluminum or baked enamel, to eliminate reflection.



The Adams No. 5 Snow Plow for Mounting on Motor Graders

The Standard Protractor model is designed for the use of mechanical, architectural and structural draftsmen. The Civil Engineers' model is designed to be used by map draftsmen while the De Luxe Civil Engineers' model has the same feature as the Civil Engineers' model, but in addition is fitted with a micrometer adjustment screw tangent to the protractor, which aids in setting off the required angle rapidly and accurately.

Jaeger Machine Co. Opens New Office Building

The expansion of the business of the Jaeger Machine Co., Columbus, Ohio, manufacturer of construction and road building equipment, which during the first eight months of 1936 more than doubled the entire volume of 1935, made necessary larger and more efficiently arranged office quarters. Accordingly, the company moved last month into its new general office building, features of which are year-round air conditioning, completely insulated construction, and scientific lighting.

All offices have been located on one main floor, and on the floor below is a 10,000 square foot show room for displaying and demonstrating the company's pumps, mixers, hoists, truck-mixers and other construction and road machinery.

The company's former office building has been converted into shops and an experimental plant.

A TRAILER For Every Heavy Duty Requirement
The LaCrosse TuWay
- Fully Reversible—Pulls from either end
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Meets all road width restrictions
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STRONG—because we use heat treated and annealed alloy steel castings, rugged design. Easy to handle because it is lighter weight and better balanced.

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Gas, Diesel or Electric Power.

INVADER
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Underpass and Bridge Job in Reno, Nev.

(Continued from page 2)

drainage structure on this underpass as the river immediately below cares for all water that might accumulate in the underpass. The roadway excavation, after the Southern Pacific tracks were shoo-flied around the work, was handled with a 1½-yard Northwest shovel. The material excavated was hauled by three 6-yard Mack trucks to a stockpile about 300 feet away from the work for use as backfill when the walls and abutments were completed. The material was piled carefully and trimmed by a Caterpillar Fifty-five and a LeTourneau bulldozer.

Another problem of the work was the handling of two large irrigation ditches which crossed the work between the bridge and the underpass. These were carried beneath the grade by a 6 x 6-foot box siphon and a 10 x 4-foot box culvert.

Quantities

The bid price for the complete project of bridge and underpass was $153,351.50 and the major quantities involved were:

Roadway excavation	26,446 cubic yards
Structure excavation	2,335 cubic yards
Class A concrete	3,135 cubic yards
Class A concrete for curb, gutter and sidewalks	270 cubic yards
Class D concrete for pier caps, deck and rail	271 cubic yards
Concrete rail cast in place	1,466 linear feet
Reinforcing steel	330,500 pounds
Structural steel	391,000 pounds

Personnel

The contract for the construction of the Alameda Street underpass and bridge was awarded to J. F. Knapp of Oakland, Calif., for whom a partner, Joseph Shaw, was General Superintendent. J. M. Murphy was Resident Engineer for the Nevada State Highway Department.

A New Material Spreader

A new spreader for handling dust, screenings, gravel, sand or chips on new macadam and black top construction and maintenance, and for spreading cinders, salt, sand or chemicals for anti-skid work, has been announced by the All-Purpose Spreader Co., Elyria, Ohio.

The spreader is attached to the back of a dump truck, the materials being dumped through the end gate into a large hopper. The material is then discharged through a manually-controlled measuring gate in the hopper onto a revolving disc which casts the material onto the ground in a circular or umbrella-shaped shower. The power for whirling the disc comes from the traction of the four industrial-type pneumatic tires on which the spreader rests.

These tires are mounted on wheels fastened to a horizontal axle, which passes through an automotive-type differential, which in turn drives a vertical axle connected to the disc. Thus as the unit is moved over the road, the traction of the wheels causes the disc to revolve in proportion to the speed of the unit. All propelling gears run in lubricant. Due to this differential action, it is claimed that the spreader is equally efficient moved forward or backward.

Above, An All-Purpose Spreader In Use on the Road and Below, a Close-Up of the Unit

A wide range of width of spread may be obtained, varying from 3 feet on shoulder work to 30 feet on anti-skid work. The amount of material spread can be varied from 0 to 85 pounds per square yard.

Literature describing and illustrating this All-Purpose spreader may be secured direct from the manufacturer.

Bulldozer Tackles Snow and Moves High Drifts

The effective bulldozer used so universally for leveling piles of earth dumped by trucks has taken its place in the field of snow removal. The Bullgrader, made by the Bucyrus-Erie Co., South Milwaukee, Wis., established its value as a snow removal unit last winter by tackling high drifts where its hydraulically-powered blade, fast blade travel and high reach made it possible for it to clear streets and highways rapidly.

A Bullgrader Mounted on a TracTracTor Bucking Snow Drifts

In shallow drifts, the blade is angled to side-cast continuously as the tractor moves ahead, thus clearing a wide swath while the unit moves forward at full tractor speed. A special blade, larger than that used for dirt moving, is now available as snow removal equipment with the Bullgrader.

USE RIGHT BUCKET FOR THE JOB

Hayward makes all four — clam shell, drag-line, electric motor, orange peel. A Hayward recommendation is unprejudiced.

THE HAYWARD CO., 32-36 Dey St., New York

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ROAD FORMS-also
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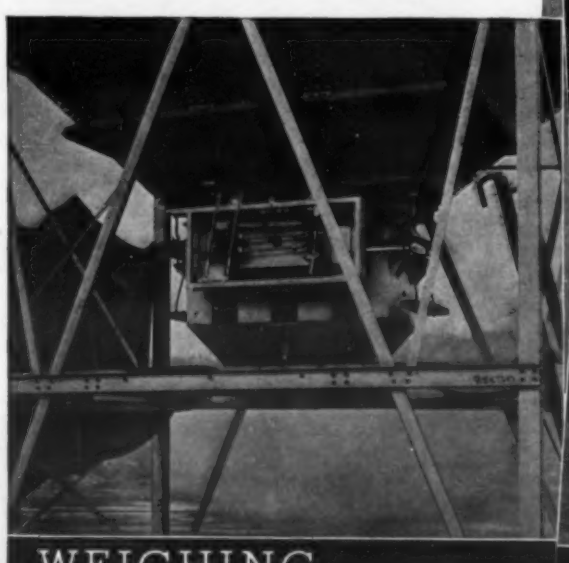
ROAD FINISHERS
Gas and Gas-Electric Types

STEEL STREET FORMS



WEIGHING BATCHERPLANTS

TAMPING ROLLERS

ROAD builders everywhere avail themselves of Blaw-Knox ability to design, build and fit equipment into the particular spot on the job where *reliability* means paving progress—and profits.

Your road building operations will proceed with uninterrupted speed with Blaw-Knox Equipment on the job.

Descriptive literature and prices will be furnished on request.

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Rock Asphalt Heaters

When using natural rock asphalt for street and highway maintenance, it is frequently advisable to heat it before laying, especially in cold weather and when handling material which has been stockpiled for some time. Heated rock asphalt can be placed in holes or on depressed surfaces much more readily than cold material and makes a patch which stays in place. It also assumes full compaction under roller or tamper, which is not always obtained when it is laid cold.

The Kentucky Rock Asphalt Institute, Louisville, Ky., and the White Mfg. Co., Elkhart, Ind., have developed a new piece of heating equipment for rock asphalt. It consists of an all-steel box or heating chamber, mounted on wheels or plain steel skids. Near the top of the box is a heavy wire mesh screen on which the rock asphalt is dumped or loaded. Immediately under the screen is an inverted V heat deflector which prevents direct flame contact with the bituminous material.

As the material becomes warm and dry, it drops through the screen into a lower compartment. It may be necessary to stir it to break lumps or to jar the screen so that material will fall through. A large hinged door permits the warm material to be shoveled out. In cold weather, the asphalt can be kept in the box, if desired, during patching work and the heat retained by throwing a canvas over the top of the unit.

Heat is furnished by a White self-generating burner held in a bracket at one end. Fuel is supplied from a 15 or 20-gallon kerosene tank, with hand air pump, pressure gage and safety filler cap. This torch outfit can be used for many purposes, such as drying and heating pavement to be repaired, for burning weeds, thawing catch basins, and for similar services where a clean voluminous flame is needed.

The heating box has four drop handles for lifting. Wheels are furnished so that the heater can be moved around jobs or for towing at slow speeds. The wheels are quickly detachable. At the front is a towing tongue with swiveled wheel and pneumatic tire which can be removed by withdrawing the king pin. At the rear are two cushion-tired wheels on an axle, mounted on two coiled springs. By simply lifting up the box by its handles, the axle with wheels drop off.

Circular No. 29, containing complete details on this rock asphalt heater, may be secured from the White Mfg. Co. or from the Kentucky Rock Asphalt Institute.

The four bridges across the East River from Manhattan to Queens, N. Y., carried a daily average of 9,940 cars in 1910, while in 1934 the motor traffic for these same four bridges had increased to 257,131 cars a day.

CONCRETE VIBRATORS

Air operated vibrators for all classes of concrete construction including bridge deck slabs, dams and locks.

Portable Vibrating Screed Boards for highway pavements.

Special steam operated vibrators for placing hot asphalt mixtures.

Write for circulars and engineering data

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997 West Side Ave. Jersey City, N. J.

Two New Jackhammers

The JA-30 jackhammer, one of the two new jackhammers recently announced by Ingersoll-Rand Co., 11 Broadway, New York City, is designed for use in light rock drilling, such as blockholing, trimming, scaling, holes for conduits, pipes, railings, foundation bolts, maintenance and demolition work. It is claimed that this new hammer is fast in action and requires but a small amount of air.

The other new hammer, the JA-45, weighs about 45 pounds and is about 21 inches long. It is claimed that up to a third more drilling may be secured from the same amount of air compressor equipment through the use of these new hammers. For example, if a portable compressor is now operating two 55-pound drills, three of the new JA-45's can be substituted. This hammer is available in dry, wet and blower styles.

Copies of Bulletin No. 2254, describing and illustrating the JA-30, and Bulletin No. 2266 on the JA-45 may be secured direct from the manufacturer by mentioning this magazine.

Rotary Louvre Dryers Now Made by Link-Belt

Announcement has been made by the Link-Belt Co., 300 W. Pershing Road, Chicago, Ill., of the acquisition of the manufacturing and sales rights in North America for the Dunford & Elliott rotary louvre dryer for sand, chemicals and similar materials, many installations of which have been made in Europe, Canada and Japan.

The dryer is a mechanically-rotated horizontal drum with a series of internal channels near the circumference, into which hot air is admitted from a fan. These channels are covered by tangential plates which overlap in such a way as to leave a gap for hot air to pass from the channels into the inside of the drum and into the material contained therein, and at the same time to prevent material from falling backward. The channels are tapered so as to give the inner lining of the drum a gentle slope from the feed end to the discharge end. As the drum revolves, fresh channels come underneath the charge, but as the hot air can only enter the channels when they are actually underneath the charge, all the gases must pass upwards through the bed of material.

The Rotary Louvre Dryer Now Made By Link-Belt

These dryers are described in detail, and illustrated, in a new 4-page booklet No. 1511 which the Link-Belt Co. will be glad to send gratis to readers of this magazine.

Do you buy
TONS OF WEIGHT or
YARDS OF OUTPUT?
The ¾ yd. L-40 weighs but little more than most ½ yd. units—yet it handles a full, honest ¾ yd. dipper to the complete satisfaction of a daily increasing list of owners . . . In any shovel, the front end can lift only what the tail end will counterbalance. Between these points, weight contributes little to stability . . . That is why the L-40 utilizes the patented sloping machinery frame which enables concentrating the weight of the necessary machinery as far as possible back of the tipping point . . . This feature is the single greatest factor in giving ¾ yd. capacity at ½ yd. weight and price . . . You'll find it exclusively on the Lorain 40, the world's fastest selling ¾ yd. machine.
LORAIN-40
LORAINS
MOVE MORE MATERIAL FASTER AT LOWER COST
THE UNIVERSAL CRANE CO., LORAIN, OHIO

Grading Job Speeded By Careful Planning

(Continued from page 2)

was a limestone that drilled quite well. The Cleveland wagon drill which used steel up to 15 feet ran holes at the rate of about 1 foot in 2 minutes. The steel was used mostly in 6 and 12-foot lengths with Timken detachable bits. A Schramm 320-foot compressor mounted on a Ford truck provided power for the wagon drill and later for two Cleveland jackhammers. The jackhammers drilled 1 foot in about 6 minutes. An O.K. portable compressor and an Ingersoll-Rand compressor on a truck furnished power for jackhammers at various parts of the job. All large stone too big for the shovels to handle was redrilled and shot, as the contractor believes mud-capping too expensive.

Instead of having a portable magazine on the job the contractor used the magazine of a local quarry that later supplied aggregate for the concrete. Forty per cent dynamite was used throughout. Shooting was done with a novel reel made by the Superintendent and a duPont blasting machine. The wooden reel prevented the kinking and breaking of the blasting wires and made attachment of the blasting machine a matter of moments.

The Borrow Pit and Hired Trucks

The borrow pit was one of the keys to the profitable handling of this job, and such a borrow pit as it was! Located about 0.9-mile haul from the major fills with one-way traffic to prevent delays it presented a smooth proposition. The face of the pit was about 135 feet wide and 12 feet high, permitting the trucks to run in and wait without hindering the movement of the shovel or the truck being loaded. The second Erie shovel worked in the pit.

Trucks of one size, 1½-yard, were used under the shovel to prevent the inevitable piling up when large and small trucks are mixed in a hauling fleet. There were eight rented and two company trucks used and the time that every truck left the shovel was recorded by a checker at the pit. As the trucks were paid by the hour this made it possible to determine whether any of the hired trucks were "soldiering." On the 0.9-mile haul the trucks made the round trip in 10 to 13 minutes. Only company trucks were used for hauling from the shovels handling rock in the cuts as they were better fitted with heavier metal beds to withstand the pounding of the rock. At the southwest end where there was another heavy fill the haul was 1.5 miles from the pit. On May 15 the fleet of nine trucks handled 750 yards from the pit on the 0.9-mile haul in 11 hours.

Making the Fills

Because of the heavy production of rock in relation to the amount of the fills the contractor secured special permission to place a 2-foot rock layer under all fills. All large pieces of rock were hand chinked by a laborer to insure the stability of the base of the fill. The earth was spread in 8-inch layers and rolled, there being a minimum of 18 inches of earth at the top of each fill.

Three Caterpillar tractors and two rollers handled the material on the fills; a Caterpillar Fifty diesel with a Wood trailbuilder, a Thirty gas tractor with a LaPlant-Choate bulldozer and a Twenty-five power grader. Two 10-ton rollers compacted the fills, a Buffalo-Springfield steam and an Acme gas-powered roller.

C. & E. M. Photo

Typical Cut Through Old Street Railway Grade for Concrete Pipe Culvert

Concrete culvert pipe from 15 inches to 36 inches diameter furnished by the Gray Concrete Pipe Co. of Hagerstown, Md., was used throughout to carry drainage across the roadway. Where other means of disposing of the accumulation of water were not available sumps were used. These were 8 x 8 feet and 12 feet deep and filled with one-man stone. On one sump a cavern 2 feet in diameter was found at the bottom insuring adequate disposal of the surface water.

The men sledging rock for the sumps and for chinking the rock in fills were all equipped with safety goggles to prevent any possibility of damage to their eyes by flying particles of rock.

Labor and Hours

As this was a Federal Aid project the working hours were limited to 40 per man per week. Labor worked from 7 a.m. for 10 to 12 hours a day with ½ hour for lunch. By working Thursday, Friday and Saturday of one week and the first three days of the following week they were able to comply with the Federal regulations and also permit overtime to make up the 40-hour limit. The wagon drill was worked two 11-hour shifts a day to keep ahead of the shovels.

Common labor and most of the skilled labor was secured through the local

(Continued on page 19)

BUYING A MIXER?

DEMAND:

- Faster Charging and Discharge Speeds,
- Machined Steel Tracks,
- 2 Wheel Mounting with Timkens and Pneumatics,
- End Discharge Advantages,
- Man-Ten Alloy Steel,

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THE JAEGER MACHINE CO.
701 Dublin Ave., Columbus, Ohio

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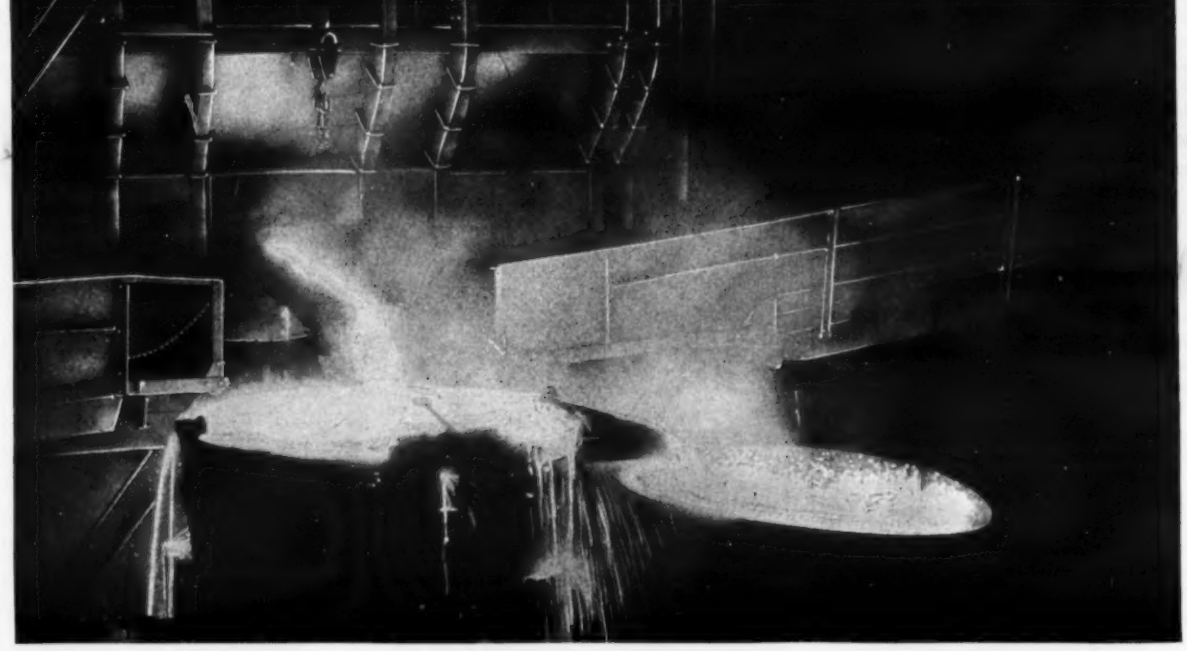
Solving Your DRAINAGE PROBLEMS Begins Here



A CORRUGATED Pipe Culvert can be no better than the metal from which it is made. To make available a metal that would stand up to the destructive conditions of modern drainage, GOHI Pure Iron-Copper Alloy was developed. After more than a quarter of a century in drainage structure service under all types of roads, under every known condition of wear, weather and corrosion, GOHI remains the longest lasting and most widely used low-cost ferrous culvert metal.

Your own highways deserve GOHI Corrugated Pipe—the best protection that money can buy. Get all the facts about the 12 big savings in highway construction and maintenance costs effected by the use of GOHI. Consult the fabricator nearest you.

Meets copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.

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Dixie Culvert Mfg. Co.	Little Rock, Ark.
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The Newport Culvert Co.	Newport, Ky.
New England Bolt Co.	Everett, Mass.
Central Culvert Co.	Ottumwa, Iowa
Capital City Culvert Co.	Madison, Wis.
F. Yeager Bridge & Culvert Works	Port Huron, Mich.
Bancroft & Martin Rolling Mills Co.	S. Portland, Maine

(62)

GOHI

PRONOUNCED "GO-HIGH" CORRUGATED PIPE

GOHI CULVERT MANUFACTURERS, INC., . . . NEWPORT, KY.

"Pay As You Go" Road Maintenance

Lancaster County, Nebraska, Centralized Responsibility in County Engineer and Built Up Effective Organization

By L. W. WEAVER
County Engineer

(Photo on page 36)

IT was not until the group of Road Overseers was replaced by a single responsible engineer in charge of all road maintenance in Lancaster County, Nebraska, that an effective organization was created. Patrol maintenance and a central repair shop have kept expenses within the income received from gasoline tax and automobile license fees.

Lancaster County, in the southeastern part of the state, is 24 miles wide, 36 miles long, and has a population of 100,000. The terrain of the county varies from gently rolling to hilly and the entire rural area is composed of improved farms. Lincoln, the County Seat as well as the State Capital, is located practically in the center of the county and has a population of 80,000. The county has a total of 1,605 miles of road, 30 per cent of which are surfaced and all-weather roads, 131 miles being part of the State and Federal-Aid system.

Nebraskans "Pay as They Go"

Lancaster County, like the State of Nebraska, operates on a "pay as you go" plan. It has no bonded indebtedness or outstanding unpaid warrants for any purpose. Neither does it have a tax levy on property for road maintenance and construction, but does all of its road construction and maintenance work with funds derived from its share of the gasoline tax and automobile license fees.

Up until about eight years ago Lancaster County maintained its road system much the same as other counties. It had four road overseers to each township, who were elected to office and had their own funds to draw on for work done on the road. Road dragging was done by farmers.

Effective Reorganization

About this time the State Legislature amended the statutes so that, in Lancaster County, the funds which were expended by the Road Overseers were transferred to the highway fund to be expended by the County Engineer, who in this county is an elected officer and supervises all road construction and maintenance work of all of the roads in the county. The amendment to this law was the go-ahead sign for the development of a proper road maintenance system.

After some experimenting, it was determined that a full-time road patrolman, with the equipment then available, could drag the roads to a satisfactory standard, in one township or about 60 miles of road.

With this information and using the township as a unit, the county was divided into patrols or road dragging districts, with the final result that, while the county has twenty-four townships, twenty-five patrols were decided upon for the reason that the heavy traffic in the vicinity of Lincoln required more maintenance.

These twenty-five patrols were to be equipped with surface maintenance equipment only. To supplement their work, a medium-sized tractor unit was to be used to do ditching, light grading work, snow plowing in the winter time and, after rains, to assist in road dragging. Eight such units were decided upon, one for each three townships.

This system and plan was organized and developed just as fast as funds would permit.

Criticism Ceases

While at first there was considerable criticism of this plan, the criticism decreased when it was found out that the roads were better maintained, until now our complaints because of poor maintenance are few and far between.

The Lancaster County Highway Shop and Garage. The Material Yard Is in the Rear of This 60 x 200-Foot Brick Structure.

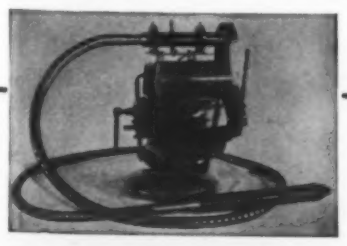
Today, after eight years, the original plan has been little changed. It is hoped, however, that with the new improved maintenance equipment, the number of patrols may be reduced slightly, effecting some saving.

Patrol stations have been built for nearly all of the patrols. Each station is equipped with a gasoline storage tank of about 800-gallon capacity, gas pump, greasing equipment and sufficient tools for making minor repairs and adjustments on the equipment.

Central Repair Shop

A county shop was developed to repair and overhaul all of the county's equipment and is furnished with all of

(Continued on page 31)



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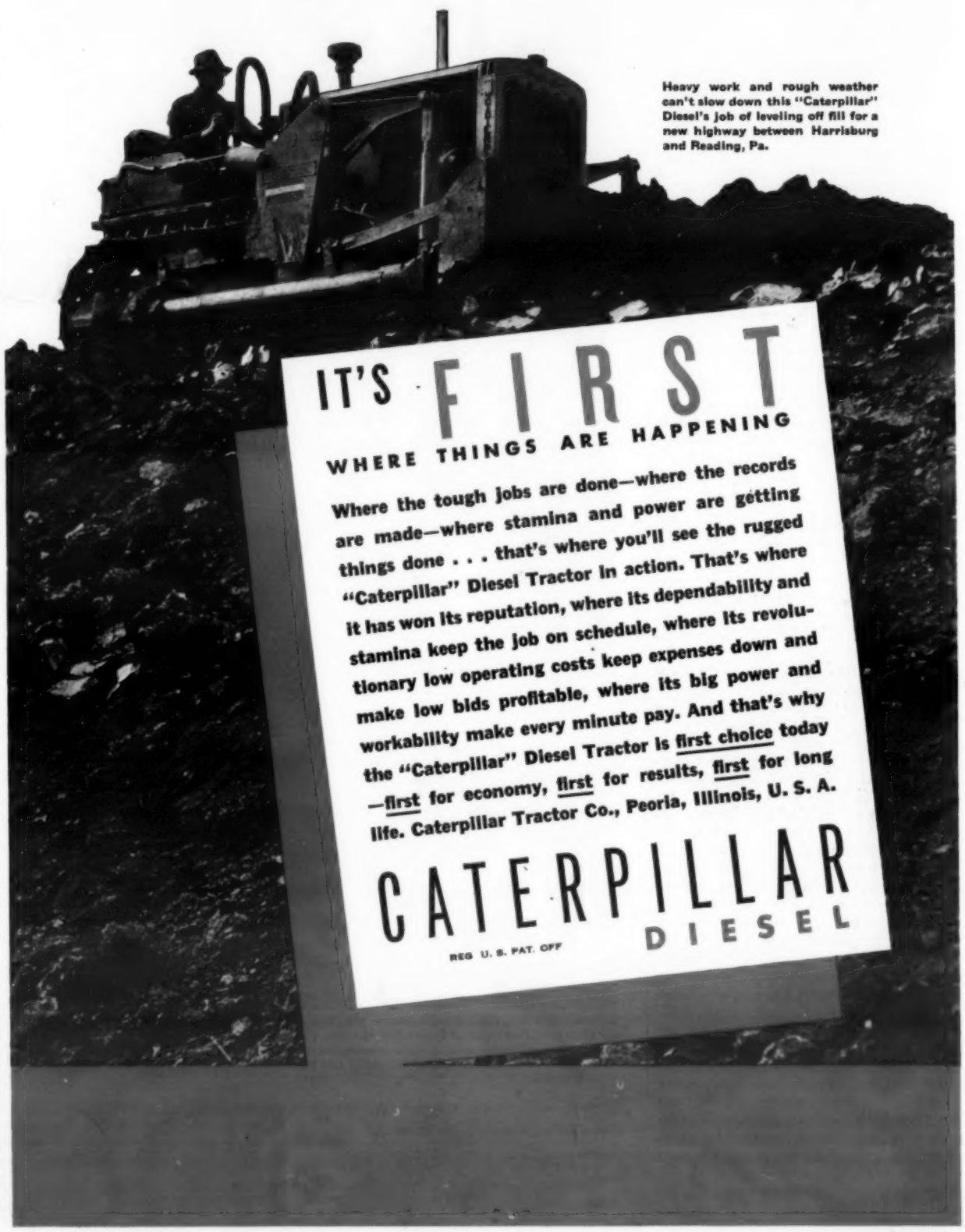
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WHERE THINGS ARE HAPPENING
Where the tough jobs are done—where the records are made—where stamina and power are getting things done . . . that's where you'll see the rugged "Caterpillar" Diesel Tractor in action. That's where it has won its reputation, where its dependability and stamina keep the job on schedule, where its revolutionary low operating costs keep expenses down and make low bids profitable, where its big power and workability make every minute pay. And that's why the "Caterpillar" Diesel Tractor is first choice today —first for economy, first for results, first for long life. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.
CATERPILLAR
DIESEL
REG U. S. PAT. OFF

Heavy work and rough weather can't slow down this "Caterpillar" Diesel's job of leveling off fill for a new highway between Harrisburg and Reading, Pa.

The Blystone All-Purpose Mixer, Showing Side Discharge

Mixers for Repairs To Concrete Roads

The new Blystone All-Purpose mixer, designed primarily for road repair work and for mixing concrete on small construction jobs of all kinds, has a number of features of particular interest to contractors and highway department officials.

The mixer is loaded from the top and dumped by tilting sideways. The Blystone machine, made by the Blystone Mfg. Co., Cambridge Springs, Pa., mixes by a reverse spiral shovel system using shovels made of manganese steel on a strong, heavy shaft. The drum is open across the top, permitting speedy loading, and the non-clog discharge door is easy to open and positive in action. The Titan metal head and drum liners are carefully fitted at the plant with the large holes bored ready to put in without tools other than a wrench. These liners are guaranteed to last for one year mixing cinder concrete and two years mixing stone aggregate concrete.

The mixing system consists of a series of shovels that thrust the materials to the right and catch them returning them to the left, at the rate of fifty times a minute. This shovel stirs and trowels the material so that every grain of sand and piece of aggregate is thoroughly surrounded by the cement.

A special bulletin on Blystone mixers has been issued which shows the various features of construction included to insure long life and absence of breakdowns. Copies of this bulletin may be secured without obligation by contractors and state and county highway engineers by mentioning this magazine.

New Sales Mgr. for Emsco

Richard A. Wheeler, for the past 14 years associated with tractors and tractor equipment, and more recently in charge of sales for the Continental Roll & Steel Foundry Co., has been appointed Sales Manager for the Tractor Equipment Division of the Emsco Derrick & Equipment Co.

Following the recent purchase of the Hutchins Winch Co., the Tractor Division Sales Office was transferred from Los Angeles to Chicago where Mr. Wheeler will make his headquarters at 332 South Michigan Avenue.

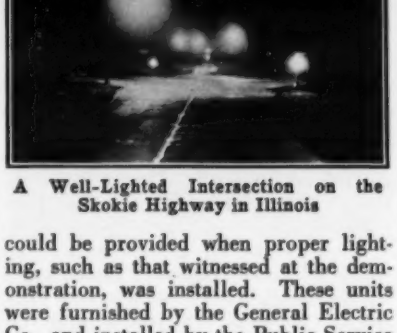
The Emsco Derrick & Equipment Co. now has four manufacturing plants located at strategic points about the country for the manufacture of cable and hydraulically-operated bulldozers, trail builders, rippers and other tractor-operated construction equipment.

During the past 18 months, while anticipating the present growing demand for equipment of their design, the Emsco Derrick & Equipment Co. has employed a large corps of engineers and well-known contracting and engineering organizations in order to make field tests of the Emsco line, under exacting working conditions. From these tests, many time-saving profit-earning designs and practices have evolved, the complete details of which may be secured by users of tractor equipment from the Chicago office or the general office at 6811 So. Alameda St., Los Angeles, Calif., by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Illinois Highway Lighted To Cut Night Accidents

"Only one-fifth of all traffic is at night, yet 64 per cent of all automobile fatalities occur after dark. The chances of your being killed on poorly lighted rural highways at night are seven times as great as they are in the daytime," stated D. D. Fennell, Vice Chairman of the Board of Directors of the Chicago Safety Council, speaking at the ceremony attending the turning on of twenty-six sodium luminaires along a mile section of the Skokie Highway at Northbrook, Ill., near Chicago. He stated that contrary to general opinion, 74 per cent of all after-dark accidents occur on clear nights and are the result of faulty illumination.

He pointed out that in other parts of the country where modern highway lighting systems have been installed, night accidents have shown a marked decrease. In conclusion, the engineer stated that safety for night motorists could be provided when proper lighting, such as that witnessed at the demonstration, was installed. These units were furnished by the General Electric Co., and installed by the Public Service Company of Northern Illinois in a campaign by the Chicago Safety Council to decrease night accidents.



A Well-Lighted Intersection on the Skokie Highway in Illinois

The cold fact is that traffic today is a combination of an 80-mile-an-hour car in the hands of a 20-mile-an-hour driver struggling to adjust itself to a 30-mile-an-hour road.—*Fortune.*

Hunter Joins American Hoist & Derrick Staff

S. M. Hunter, formerly Sales Manager of the Novo Engine Co., is now affiliated with the Sales Department of the American Hoist & Derrick Co., St. Paul, Minn.

Irwin Joins Goodrich

G. J. Irwin, formerly Assistant Engineer of Tests, Ohio Department of Highways, has joined the machine and process development departments of the B. F. Goodrich Co., Akron, Ohio, and will be in charge of the company's highway products engineering, particularly the development and introduction of new Goodrich expansion joints and bridge materials.

Irwin, who was associated for seven years with the Portland Cement Association before joining the Ohio Highway Department, is a graduate of Dennison University.

NEW Bucyrus-Erie 19-B

5/8-YARD CONVERTIBLE EXCAVATOR » »

With any front-end equipment, the new Bucyrus-Erie 19-B is the last word in 5/8-yard output, performance and operating economy.

This new 5/8-yard winner brings you the same high-speed digging cycle; easy convertibility; rugged construction; maneuverability; and dependable, economical day-in-and-day-out operation that have made its smaller companion machine, the famous 3/8-yard 10-B, the fastest-selling excavator in the world.

Write today, or mail convenient coupon below, for full details on the NEW 19-B 5/8-yard.

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GENTLEMEN: I am interested in the NEW 5/8-YARD 19-B.
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EXCAVATING, DRILLING AND MATERIAL HANDLING EQUIPMENT... SOUTH MILWAUKEE, WISCONSIN, U. S. A.

Road Building Rebuilds Men

(Continued from page 2)

is necessary to move them about to prevent any cliques being formed. In this way the possibility of any one prisoner becoming dominant among his fellows and perhaps poisoning the minds of a group is greatly lessened. These camp jobs are considered very desirable by the prisoners, and they know that if their work is unsatisfactory, they will be transferred to pick and shovel work on the grade.

The guards of the camp are responsible solely to the warden of the prison. The commissary is responsible to the central office of the State Division of Highways at Sacramento, and the construction is directed by the District Engineer of the district in which the work is located.

Attitude of Prison Authorities

Without exception the wardens of the prisons want more men out on road work as the prisons are already overcrowded and the use of men on useful work is a great relief to the prison authorities. They also appreciate the great benefits to the men resulting from the freedom possible in the camps. There are no fences nor anything to indicate that a prison camp is located in the vicinity. Signs are placed to designate the limits of the camp beyond which the prisoners are not permitted to go at any time unless at work. The early signs read "Prison Camp" but they disappeared quickly. Now the signs simply read, "Camp Limit."

Warden Holohan, in his article referred to above, asks the question, "Why should men beg for this chance?" He calls to the readers' attention the fact that the road camps take them into the real out-of-doors for the first time in one, three, five or more years. They no longer are jammed together like sardines. They are earning their way now by honest sweat and more. They are able to draw a net pay around 35 cents a day, besides earning their own food, shelter, shoes and clothes. And if one thinks that the 35 cents sounds like a trifle Warden Holohan says, "You should see what the prison camp workers can do with it. Maybe they have dependents at home. At last they are able to send their wife and children a little money. They immediately are new men, as far as their morale is concerned. Or they can store up their earnings against the day when they will be paroled and instead of leaving the Big House with only the state's gift of $10 and a prison made suit, they will have enough to take them to a job. Tremendous trifles!"

Objections of Labor Unions

The labor unions have not registered any complaint against the system of prison labor in road camps because the men are not used for any skilled labor. The highest type of work performed is the use of jackhammers and drills.

Attitude of Contractors

In general and on what seem like sound economic principles, contractors object to the use of any prison labor on the highways where the work could be performed by contract. The highway engineers watch the costs of the work with great care and local accredited officials of the A. G. C. are allowed access to the costs of all convict work to assure that the work is being done to the best advantage from the standpoint of the taxpayer. When it is explained that it is more expensive to keep a man in prison than it is to place him on work on the public highway and that to have him in a road camp is reducing the tax burden, there seems to be more justification for the use of this labor. Further the men are seldom placed on a type of work that can readily be done by contract either because it is distinctly a day labor proposition or else the work is of a nature that there is too great an economic hazard involved and no contractor wants to undertake the work for a fixed sum.

Financial Obligation of Job

Budgets are set up for each camp to be expended at a given rate per month and the estimated cost of the project divided by the monthly budget gives the approximate number of months to complete the work. The project estimate for the job is comparable to the contract price and all costs of the job are charged against the monthly budget. The Superintendent rents his equipment from the state highway department, and the pay roll of the prisoners, the free labor and all materials are similarly charged. In this manner there can be no dodging of the costs of the project as they all must be charged definitely against the budget item.

All the superintendents are on civil service, as are all state highway department employees, and if he is not diligent and effective in keeping costs down he is laid off or shifted to work more in keeping with his ability. All labor in the camp aside from the prisoners is

(Continued on page 26)

SURE!

Most contractors today concede that LeTourneau equipment moves dirt cheaper than is possible by any other method. Jobs everywhere prove that. What they ask us now is: "Will Carryalls work in boulder-strewn ground?" "Will they backfill?" "Can Angledozers and Bulldozers clear trees and stumps?"

Sure!

Just as jobs have proved the ability of LeTourneau equipment to move dirt cheaply and quickly, so our own job experience and the job experience of hundreds of users have proved that LeTourneau Carryalls can pick up and move fairly large rock, that backfilling is no trick to the skillful operator, that Angledozers and Bulldozers can fell trees and uproot stumps, that LeTourneau's fast-acting, powerful cable control enables LeTourneau equipment to do many things that to ordinary equipment are impossible. Some of these things are pictured here.

Up and Over!—The tractor pushed forward and the powerful hoist available through cable control of the Angledozer lifted upward to fell this 10-inch tree in 3 minutes on an Upper Michigan logging road.

Rock Grabber—This rock is one of many loaded by Frank Gammino's 8-Yard Carryall on a job near Norwich, Connecticut. No other scraper has the rock-carrying ability of the LeTourneau Carryall, because no other scraper has such a high, wide apron lift or such a strong, double-steel bottom.

Extra Line Profitable—Morrison-Knudsen, long-time fleet user, pulls logs with the extra line from a 2-drum Power Control Unit mounted on its Angledozer-equipped tractor. Many a user has found cables from the Power Control Unit handy for this purpose and for pulling out bogged equipment.

Ask your Caterpillar tractor dealer to show you what others are doing with LeTourneau equipment.

Backfilling—Contractor Roy T. Smith backfilled into a ravine with his LeTourneau 12-Yard Carryall on a W.P.A. job in Georgia. Many a LeTourneau contractor has used this method of backfilling around culverts where bulldozers were not available.

R. G. LeTOURNEAU, INC.

PEORIA, ILLINOIS STOCKTON, CALIFORNIA

Cable address: "Bobletorno".

Manufacturers of: ANGLEDOZERS*, BUGGIES*, BULLDOZERS, CARRYALL* SCRAPERS, CRANES, DRAG SCRAPERS, POWER CONTROL UNITS, ROOTERS*, SEMI-TRAILERS.

*Name registered U.S. Patent Office.

LETOURNEAU

Old Concrete Road Widened in Mo.

(Continued from page 1)

Blaw-Knox steel forms. For the first cut over the grade an R-B Finegrader made the trip and carried the excess dirt out over the forms. This machine was pulled ahead steadily by its own power, using a pair of cables staked firmly ahead. Behind this a first checking board was pulled by the 5-ton Huber roller that rolled the grade to firmness.

The crew that worked under the grade foreman and handled the grade and form setting consisted of two form-setters, one of whom worked ahead on the string and then back lining up the forms, a form-setter's helper, one man working solely on form trench ahead of the setters, three fine grade men, a form tamper man operating the mechanical form tamper run by a small Lauson gas engine, and a miscellaneous crew of grade men, making up a total of nineteen working on these operations, including the truck driver. All soft spots in the grade were hand tamped after the roller had pulled the first grade board over. The low spots were filled by hand and the hand tamper saw to it that they were firm and compact.

Batching Aggregates and Cement

Aggregates for this project were delivered to a siding in Pacific, Mo., at the west end of the project. This seemingly wasteful location, as far as haul is concerned, was chosen with forethought as it is really in the center of the series of contracts that this one organization was able to secure. A Koehring 401 crane with a 1-yard Owen clamshell unloaded the aggregates from the gondola cars to the bins of the Johnson batchers. The batches were made up with the following dry weights of materials: 1,380 pounds of sand, 2,096 pounds of gravel, and 595 pounds of cement.

The fleet of six to fourteen 2-batch trucks hired locally arrived at the batching plant and backed under the batchers for their loads and then drove out and around the corner to the platform where the bulk cement was being unloaded and weighed. The contractor planned to work from one car of cement at a time but when a car got quite low a second was opened and worked with the other. Three men shoveled cement and two wheeled the four Johnson Kone Karts from the cars to the Fairbanks scales where they were checked for weight. The dumping trap was well constructed with one long slot over each batch compartment in the truck below so that the man dumping the carts could slowly wheel the cart forward and distribute the cement uniformly across the entire top of the batch. The drivers covered the cement with canvas covers as soon as they pulled away from the cement platform.

Contraction and Expansion Joints

Inasmuch as the paver ran on the old pavement, the joints could be set in the widening strip well ahead of paving. The contractor used Translode metal joints for both contraction and expansion joints. The contraction joint consists of a series of sheet metal sections cut to crown and used separately for flexibility. Groups of three lugs cut from heavy sheet metal project on either side and fold under the vertical section like a flattened Z. Over the bottom legs of the lug sections on either side is a holding strip of strap iron. At the top, a copper sealing strip runs across the entire width of the joint and is molded to form a slot into which a metal strip is inserted during the paving operations and removed later by the joint finisher. The entire contraction joint and the copper sealing strip is held firmly in place by separate metal clips running under the joint.

The expansion joints are similar except that a 1-inch air space is provided between two metal sides and sealed at the two ends against the entrance of earth and water. On the 10-foot widening strip four rolls of 2½-foot wide paving paper, slightly lighter and more waterproof than ordinary roofing paper, was spread longitudinally, lapping slightly. The joints were pinned securely in place with the pins driven through the paving paper and were held with four of these U plates consisting of a heavy metal top upset at the middle to fit snugly over the joints and then extending about 6 inches either side of the joint so as to clear it. Two ¾-inch pins were driven through holes at the ends and down until the top piece held the joint firmly in place. The expansion joints were held with only three of these straddle bolts.

The expansion and contraction joints were placed alternately and 40 feet apart.

Concreting

The Rex 27E paver, running on the old slab, was supported to distribute the load on transverse 3-inch x 12-inch x 4-foot planks. It carried a boom made of heavy pipe running out across the 10-foot widening strip and with a sheave at either side of the strip for cables to pull the heavy strike-off which had wheels running on the form and the old slab. The concrete was struck off 1½ inches from the top of the forms and the reinforcing mesh laid in. The specifications state that the mesh shall be placed 2 to 3 inches below the top but the settlement and compaction of the concrete when the top is poured and the finishing machine run over causes the mesh finally to reach the specified elevation. The timing device on the paver was set for a 64-second mix after the chute had been raised to top position.

When the paving crew reached one of the joints the strike-off pulled the concrete up to within a foot or two of the joint and then the paver operator spotted a batch on the other side about the same distance away and not over the joint as is done in most cases. A pair of the puddlers then stepped in and shoveled the concrete against the joint simultaneously from both sides. Then the strike-off was lifted over the joint by a pair of wooden risers attached to the forms.

CONTROLLED IGNITION .. REGARDLESS OF VARIATIONS IN DIESEL FUEL OILS

THE ignition point in Allis-Chalmers Oil Tractors is definitely controlled and accurately timed. This exclusive feature not only assures smoother operation and more responsive performance . . . it also gives you a wider choice of Diesel fuel oils. Controlled spark ignition enables Allis-Chalmers Oil Tractors to burn any good grade of clean Diesel fuel. Their performance is not limited by the self-combustion properties of different grades of fuel . . . a definite advantage under actual job conditions.

Neither is it necessary to use a special grade of lubricating oil. The spark ignition engine operates with normal compression pressures . . . and without excessive heat. Contamination and breaking down of lubricants is no problem.

For the first time . . . flexibility, balance, smoothness and instant starting have been combined with Diesel fuel oil economy. Investigate now. Branch house and dealer service everywhere.

DEPENDABLE STARTING . . .
DEPENDABLE PERFORMANCE

The built-in quality and dependability of A-C tractors proves itself when conditions are most severe. Instant starting—regardless of weather .. quick maneuvering .. power .. traction .. and the durability to KEEP GOING!

ALLIS-CHALMERS
TRACTOR DIVISION—MILWAUKEE, U. S. A.

The screed of the Lakewood finishing machine was also lifted over the joint on its first pass. Between the first and second pass the straddle bolts or holders were taken out and the finishing machine filled the space uniformly.

The concrete crew consisted of four puddlers in the concrete, one puddler outside, two steel men who passed in the mesh and moved the "lifter-uppers" for the strike-off, a man using the Jackson vibrator on both sides of all joints and against the forms and slab, and the operators for the paver and the adjustable finishing machine.

Finishing

The first hand finishing operation was the use of a 5-foot long-handled float followed by a 10-foot aluminum drag straight-edge and then a special 10-foot alloy straight-edge. This special straight-edge consists of a T section edge with the outer foot at each end slightly turned up and then the remaining 8 feet is held rigid by a special truss made of sheet metal of a special unknown alloy and punched with large holes to make it light.

Following these operations, an 8-inch canvas belt, 3-ply, was run along the slab to remove excess water and laitance. The first finisher on edges then took up the work and edged the sides and floated in the joints. This is most important in insuring the success of the type of expansion and contraction joints used in Missouri. By placing a 1-inch plank in the top of the expansion joint while the concrete is still wet, he is able to prevent its becoming filled with the concrete. He cleans out the concrete that has worked into the joint, and places the plank which is made with a slight shoulder on either side so that it fits over the copper sealing strip and prevents concrete setting on the strip and forming a fin. A narrow metal strip similarly protects the contraction joint.

The Joint Finisher

The joint finisher worked just ahead of the brooming operation. He removed the metal strip from the contraction joint and the installation bar from the expansion joint. After working the joint he carefully floated the two sides of the joint and used a straddle straight-edge across it to insure that it would ride

(Continued on page 23)

Grading Job Speeded By Careful Planning

(Continued from page 14)

office of the Federal Re-employment Service and 80 per cent of the common labor came from Franklin County in which the project was located. This applied to skilled operators as well. The average payroll on this contract was between 90 and 100 men.

The Superintendent used three foremen and placed entire responsibility for the work upon them. They were a Grade Foreman, a Powder Foreman and a Pipe Foreman. This left the Superintendent free to handle the larger problems on the job and the speed with which everything moved showed the value of this type of organization. For most of the time the work was 75 per cent ahead of schedule, due to careful planning before the bid was entered and by good management after the work was started. From April 13 when work was started not one hour was lost until May 13 when a torrential rainstorm shut the work down. No equipment breakdowns nor lack of trucks or material held up the job at any time. Ninety-five working days were allowed for this job in the contract and it was completed well inside the limit.

Water Supply

Inasmuch as the contractor feels that steam shovels handle rock better than other powered units he used steam power throughout. This required water from the very start of the job. Inasmuch as water was to be used for the concrete paver later the 2-inch water line was laid on the shoulder from one end to the other with valves every 150 feet. Water was secured by meter from the city of Shippensburg but as the pressure was not sufficient for the 2.27-mile line a booster pump was installed at the northeast end of the job. This was a C. H. & E. triplex. The paver carried 200 feet of hose.

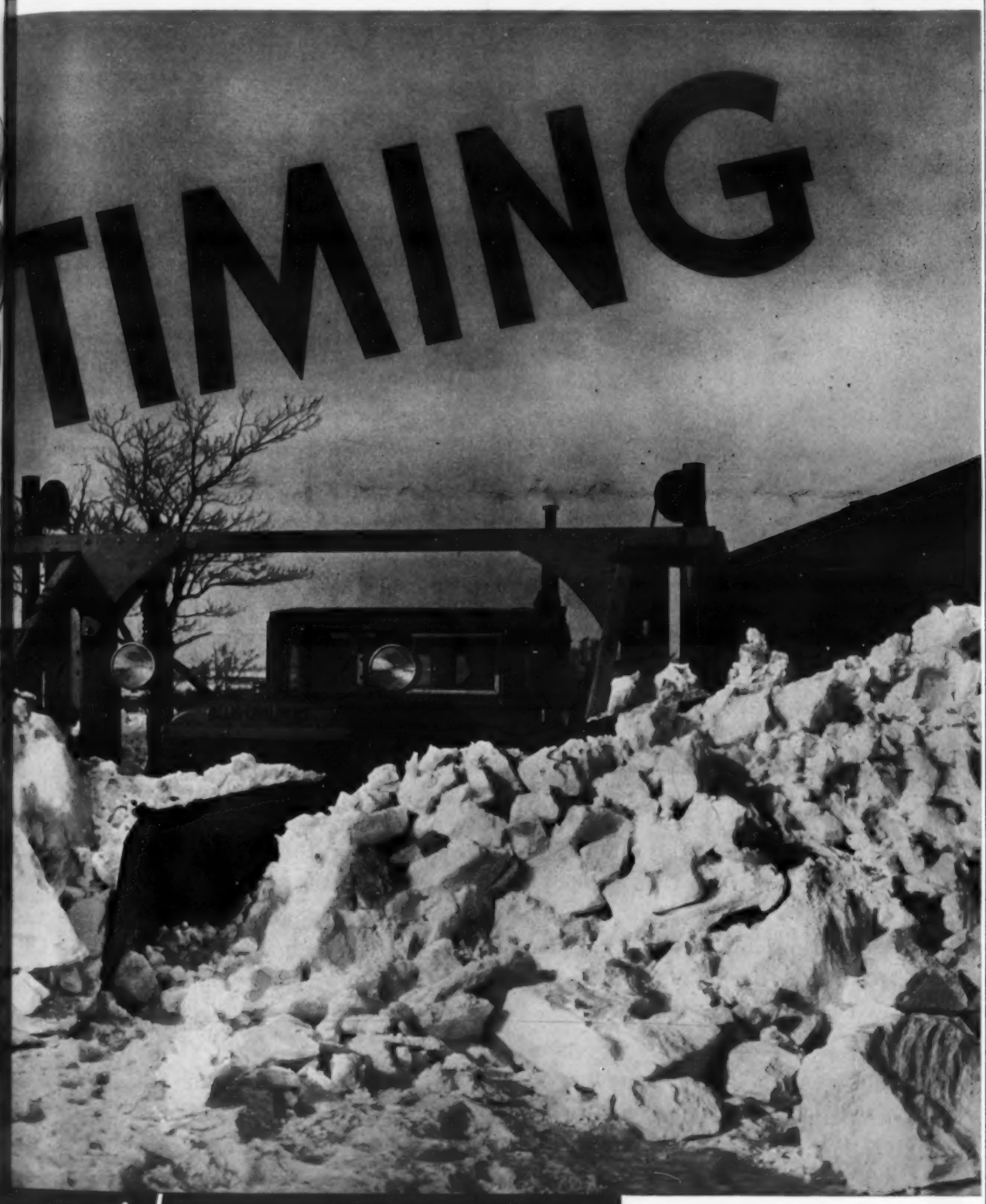
Laying the Dual-Type Pavement

For the two 10-foot concrete strips of pavement the contractor set up a Blaw-Knox batching plant on a railroad siding at Shippensburg. Stone from the local quarry of Paul Walker was purchased loaded on company trucks at the quarry and hauled to stockpiles at the batcher. Before the concreting was started the stockpiles contained 85 per cent of the required stone. Sand was furnished by the Arundel Sand & Gravel Co. from its plant at Port Covington, Md. and delivered by rail. Both sand and stone were loaded to the batcher bins by the versatile Erie steam shovel converted to a crane again.

Concreting was started about May 28 and as planned required only 20 working days. Paving was started on the right hand lane out of Shippensburg with the paver running in the 10-foot strip between the two concrete strips. The paver returned on the left hand strip, permitting the trucks to haul for a large part of the time on the other concrete. This sequence also permitted cleaning up of the center strip and the shoulders to start at the lower end of the job and follow the paver back toward Shippensburg, leaving everything shipshape for the bituminous work as soon as the concrete was cured. The center strip was paved with plant-mix bituminous concrete.

Personnel

This 2.27-mile dual-type pavement was awarded to H. J. Williams Co., Inc., York, Pa. for $138,871.67, and was completed under the direction of C. O. Albright as Superintendent. For the Department of Highways of Pennsylvania the work was under the direction of H. H. Temple, Chief Engineer, with Guiton Kempter, Senior Inspector, in charge.



DIGGING WISCONSIN OUT

During the storm crisis of last winter, Wisconsin highway officials chose Allis-Chalmers tractors at a ratio of 8 A-C's to 1 of all other makes. This is a typical scene in Fond du Lac county.

A Demonstration of the Effectiveness of Hog Wire Velocity Checks in Streams. The Stream Bed Has Filled Up 3 Feet in One Flood.

Checking Soil Erosion With Hog Wire Fence

(Continued from page 1)

crete lining of the arroyo banks. This completely stopped the undercutting of the slabs and left a smooth bottom to the creek.

The Old Type of Check

The old type of check was not a check at all but rather a wire fence set on wooden posts along the stream bank and backed with one-man stone and smaller. When the current struck a section of this fence it washed out beneath the fence and the stone dropped into the hole and was supposed to stop further erosion. This was quite effective at some points but did not fill the requirements of constant effectiveness and economy in construction.

Proper Placing Important

The sheer simplicity of the new type of velocity check may work to its disadvantage unless those who would install them are fully cognizant of their proper installation. For the larger installations, to check the erosion of river banks where the flow is rapid and in large volume, standard 33-foot railroad rails are driven 20 feet into the ground to support the fence, by means of a portable pile driving rig made in the Superior shops of the State Highway Department. For most effective service the line of the check should be at 45 degrees to the line of flow of the current.

Alternate rails should be braced for heavy flows of 10 miles per hour with a volume of 15,000 second-feet, such as occurred on the Santa Cruz River where one of these checks has been installed, but for small flows in narrow arroyos bracing is not necessary. For the bracing, in which the same rails are used, back rails are driven, using 20-foot rails driven 19 feet into the ground.

There are two braces on the alternate rails, one of the braces being at right angles to the current and the other at right angles to the fence line. The long diagonal brace has a hole burned out near the end so that it can be readily slipped over the top of the back rail. At the other end where it is attached to the post rail the head and base of the rail are cut away with the acetylene torch and a slot cut in the post rail for this piece of the flange to slip through. Thus a connection is made that requires no bolts or extra pieces for assembly.

The short brace at right angles to the fence line is notched at the lower end to fit into the angle of the other brace and the back rail, and is attached to the post similarly to the long brace.

T. S. O'Connell is State Highway Engineer, Arizona State Highway Department, and this development took place under his direction.

Additions to Personnel of Caterpillar in Southwest

Believing that the area west of the Rocky Mountains presents sales and advertising problems which can be handled more effectively by men who are on the ground and therefore familiar with changing local conditions, the Caterpillar Tractor Co., Peoria, Ill., has announced the appointment of two new men to its Western staff.

C. F. Mullins, formerly western representative for the Wehr Co., Milwaukee, Wis., has been made Caterpillar Sales Engineer in the construction and governmental field for southern California, southern Nevada, Arizona and New Mexico with headquarters at Los Angeles.

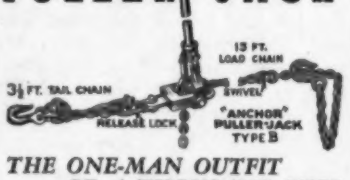
G. W. Monfort, who was formerly associated with Caterpillar and more recently has been a member of the Sales Promotion Department of the Union Oil Co., has been appointed western representative of the Caterpillar advertising department. Monfort will make his headquarters at the Western Sales Office of the company in San Leandro, Calif.

PERFORMANCE-ACCESSIBILITY

NEW
2" to 8" Self-priming Centrifugal Pump
See Bulletin 15

MARLOW PUMPS
Ridgewood, N. J.

"ANCHOR"
PULLER JACK

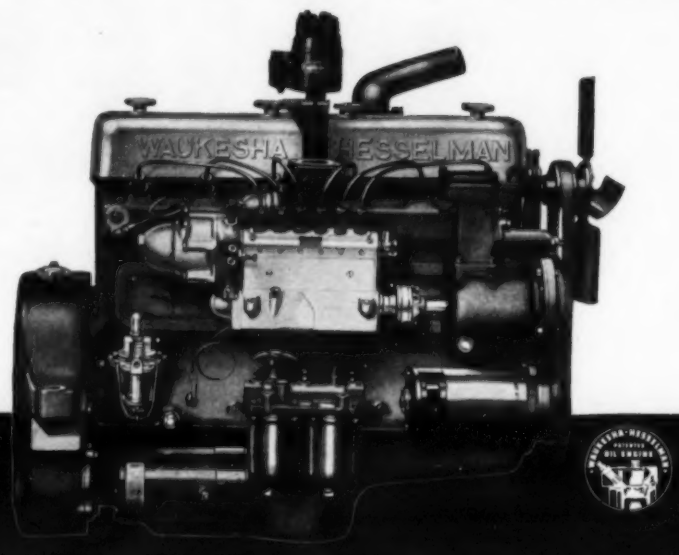


THE ONE-MAN OUTFIT OF A THOUSAND USES

The most widely used Pulling-Jack in America. Comes in handy every day. Works in any position. Pulls 6000 lbs. single line; 10,000 lbs. on two line. Pulls anything—concrete forms, piling, lagging. For handling heavy machinery. Joins pipes, belts, conveyors. Stretches cables. For erection, rigging or demolition work, or what have you.

Complete outfit as shown; includes sheave block for changing direction or doubling power. Price $30.00. Net weight 70 lbs. Simple, rugged, powerful, long-lasting. Longer chains if desired.

EDELBLUTE MANUFACTURING CO.
Reynoldsville, Penna.



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...an oil engine with these unique
SALES ADVANTAGES

In any product you engineers design—the sales advantages of that product are of first importance.

Building your product around a Waukesha-Hesselman Oil Engine makes it much easier to sell.

Hesselman Engines are low pressure engines. That means longer lived engines...longer lived clutches, transmissions, shafts, bearings and other component parts.

Hesselman Engines are the same size and weight, and fit in the same mountings as gasoline engines of equivalent power and speed. This means economical shop production...the same machine may be powered with an economical oil engine, without major changes. Engines may be switched on the loading platform if necessary.

Waukesha-Hesselman Oil Engines range in size from 20 hp. to 300 hp., both four and six cylinders. It will pay you to get full details. *Write* for Bulletin 1000. *Waukesha Motor Company, Waukesha, Wisconsin.*

WAUKESHA ENGINES

One of the New Small Northwest Shovels

New Small Shovels

New ⅜ and ½-yard shovels known as Models 15 and 18 have been announced by the Northwest Engineering Co., 1730 Steger Bldg., 28 E. Jackson Blvd., Chicago, Ill. Every effort has been made to equip these machines as advantageously as larger units. They are full capacity, full weight, and full revolving and are mounted on full length crawlers.

The operating machinery, completely enclosed in the cab but still with ample work space for maintenance, is mounted on a rotating base casting and both base and side frames are cast as a unit, assuring the maintenance of alignment of all shafts and bearings, and providing a rigid frame for the operating machinery. The standard Northwest crawlers are bronze-bushed with all gearing enclosed, roller-chain drive, and have standard self-cleaning crawler tread and roller construction.

The engine is a Ford V-8 truck model with standard starter equipment. The pumping equipment has been replaced by oversized water pumps and the transmission is a Twin Disc clutch with a flexible coupling.

The transmission is through a set of wide-faced helical gears mounted on anti-friction bearings and running in an oil-tight case. Standard equipment includes feather-touch clutch control, using the power of the engine to shift the clutches and a cushion clutch on the main clutch in the hoist drum which limits the hoist-rope pull to a definite value.

The boom is of wide base design and is all-welded as are the dipper sticks. The bucket has a manganese front with removable teeth. The sheaves are of extra large size to increase cable life.

The shovel attachment features the Northwest independent crowd. The design of these shovels permits full convertibility both by changing booms so that a shovel may be changed to a crane or dragline or vice versa and also the shovel may be removed from its crawler base to a truck base, thus converting it to a truck shovel or crane.

Portable Rock Crusher For Truck Mounting

A portable rock crusher for mounting on any truck chassis has recently been announced by the Eagle Crusher Co., Galion, Ohio. This crusher is operated from the truck motor by means of a Hercules split-drive power take-off.

The crusher has a capacity up to 10 cubic yards an hour, and may easily be adjusted for crushing rock from ¼ to 3-inch while in operation. The unit weighs 4,300 pounds and is sold complete with crusher, power take-off, belt and engine governor ready to install on any truck of 1½-ton capacity.

Moldboard Formation Features Snow Plows

The proper elevating and discharging of snow from the moment it contacts the edge of a snow plow are two of the most important functions in successful plowing. The moldboard of the new Parsons V-type plows, made by the Parsons Co., Newton, Iowa, is carefully designed so that the snow is elevated and discharged with small expenditure of power. Wet snow especially cannot be pushed easily or bulldozed squarely. The Parsons action slides and rolls the snow and forms a natural flow.

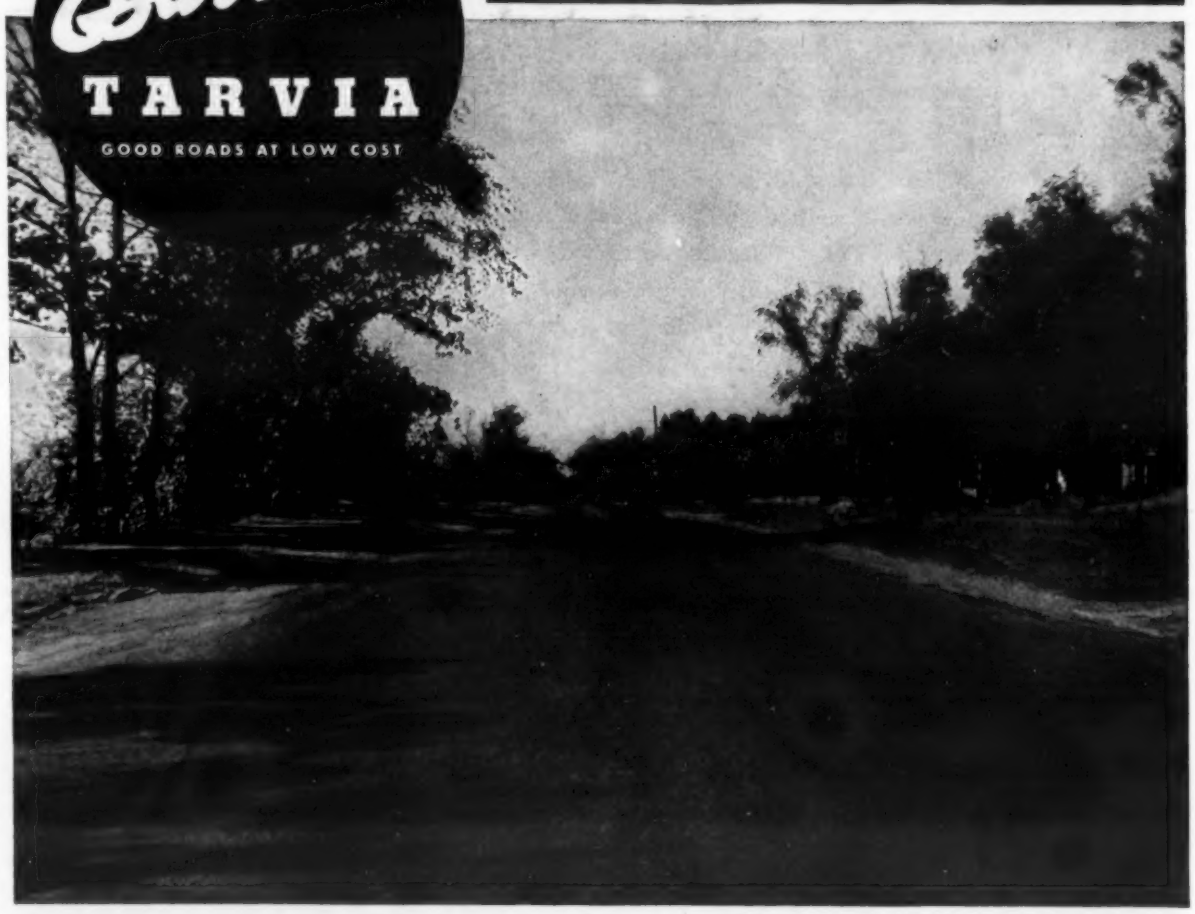
The attachment of the Parsons V-type plows is interchangeable with the one-way plows so that any tractor or heavy truck can have selective equipment of both styles fitting the same mounting.

One of the Parsons Heavy-Duty Hydraulic-Operated V Snow Plows with Hydraulic-Operated Wing Used by the Iowa Highway Commission

Control of the heavy plow is either by hand-operated working gear mechanical hoist, a hand-operated hydraulic hoist or a power-operated hydraulic hoist.

As an adjunct of the V-plow, a wing can be attached to either the front or rear of the cab, the latter being preferable. The wing is usually made for the right side only when a truck is used but in some instances both right and left wings are desirable. The V-plows are mounted close to the front of the truck, giving the operator of the truck greater control. They are fitted with a Parsons patented hydraulic tilting device so that the operator can tilt either the nose or the heel of the plow while operating without leaving the cab.

East River Boulevard, Minneapolis, Minnesota. Tarvia since 1910. One of the scores of Tarvia roads that have served Minneapolis continuously for twenty years or more.



THE TECHNICAL SERVICE BUREAU of The Barrett Company invites your consultation with its technically trained staff, without cost or obligation. Address The Technical Service Bureau, The Barrett Company, 40 Rector Street, New York, N. Y.

East River Boulevard's twenty-six years of uninterrupted service is striking evidence that Tarvia roads "can take it." Hundreds of Tarvia roads built in the days when thirty miles an hour was reckless speeding are conclusive proof. They cost little to build and maintain, and are just as smooth, easy-riding and skid-safe today as they were when they were new. Let the Tarvia field man tell you about them.

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Maine Prohibits Diversion Of Highway Funds

The diversion of highways funds to non-highway purposes is strictly prohibited in Maine by a referendum bill adopted by direct vote of the people of that state at the election in September.

Maine thus becomes the fifth state which has taken legal measures to protect highway funds from diversion, constitutional amendments for the same purpose having already been adopted in Missouri, Kansas, Minnesota and Colorado. Petitions are being circulated in Massachusetts for a referendum against diversion of gas tax money from highway construction and maintenance.

C-P Personnel Changes

Chicago Pneumatic Tool Co., New York City, has announced that W. G. Straub, formerly Manager of the New York Branch Office, has been appointed Assistant to the Executive Vice President and assumed his new duties on October 1. A. D. Stem succeeds Mr. Straub as Manager of the New York Branch Office.

Specifications for Structural Steel for Buildings

The revised 1936 specifications for the design, fabrication and erection of structural steel for buildings has just been published by the American Institute of Steel Construction. It contains, in addition to a list of the principal changes from the previous specification, eight parts covering the following subjects: general, material, loads and stresses, unit stresses, design, fabrication, erection and inspection.

Copies of this specification may be secured from the American Institute of Steel Construction, 200 Madison Ave., New York City.

New Cletrac Adv. Mgr.

The Cleveland Tractor Co., Cleveland, Ohio, has announced the appointment of C. W. Garrison, formerly with the Burns-Hall Advertising Agency, as Advertising and Sales Promotion Manager. Preceding his connection with Burns-Hall, Mr. Garrison was a director and account executive of Freeze-Vogel-Crawford, a Milwaukee advertising agency, where he served a number of manufacturers.

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ASPHALT is economical to apply

Maintenance costs of *asphalt* pavements are low

ASPHALT is long-wearing

ASPHALT can be quickly applied

ASPHALT resurfaces pavements at low cost

ASPHALT is safe because it is resilient, non-skid and non-glaring

For information and advice on the selection of materials and methods, call in a Standard representative. His services are yours for the asking, without obligation. Just phone your local Standard Oil (Indiana) office or write the main office in Chicago.

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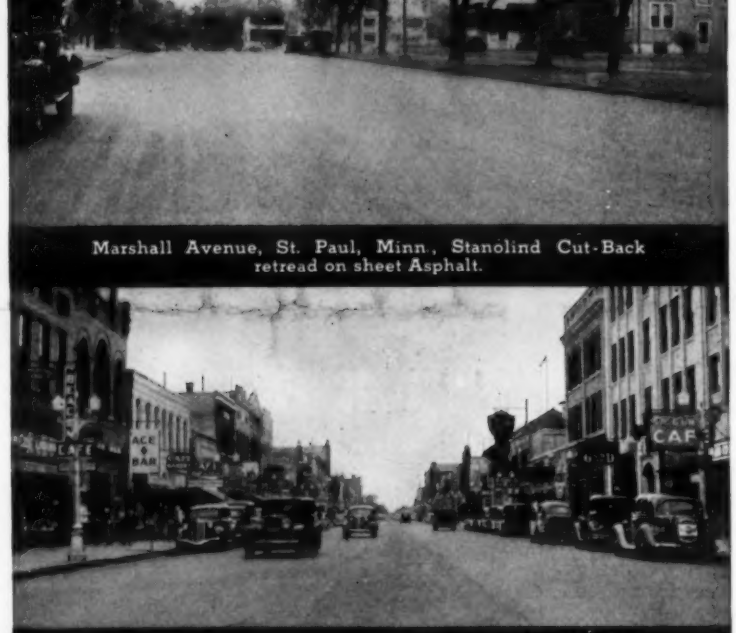
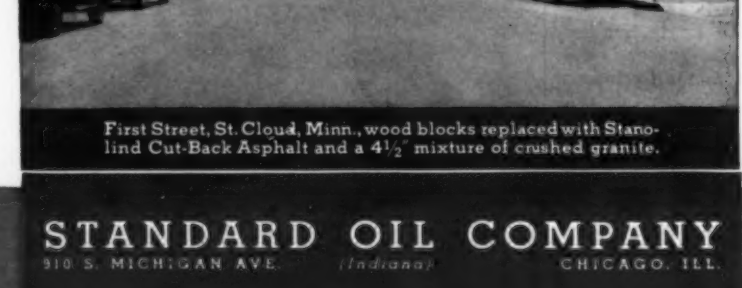


Marshall Avenue, St. Paul, Minn., Stanolind Cut-Back retread on sheet Asphalt.

St. Germain Street, St. Cloud, Minn., paved with Stanolind Cut-Back Asphalt after street car track was removed.



First Street, St. Cloud, Minn., wood blocks replaced with Stanolind Cut-Back Asphalt and a 4½" mixture of crushed granite.

Copr. 1936, Standard Oil Co.

ASPHALT goes farther

STANDARD OIL COMPANY
910 S. MICHIGAN AVE. (Indiana) CHICAGO, ILL.

IN LONG-WEARING ROAD MILES . . . IN DISTRIBUTION OF LABOR . . . IN TAXPAYER SATISFACTION

Old Concrete Road Widened in Mo.

(Continued from page 19)

smoothly. Last of all he edged the joint and left the way clear for the broom finish.

Building Lip Curb

The old dimensions of lip curb in Missouri and other states required a 3-inch flat surface at the outside but it was found that this virtually narrowed the traveled way by one half a foot and so Missouri has eliminated the flat section and makes the lip curb 9 inches wide and 3 inches high on all grades and the sides of super-elevated curves. One man went ahead and set the lip curb forms on top of the road forms and then two men shoveled concrete from a concrete sled pulled by two "Missouri" mules. This method has the advantage of providing fresh concrete for the lip curb instead of the old method of placing half drums along the road and filling them as the paver passed and covering them with wet burlap. The concrete in those cases had a chance to set and dry out and frequently had to be wet to make it workable.

With the concrete shoveled into the proper place, one man roughed in the curb with a "darby," a 30-inch board of 1 x 6-inch plank with two handles, and then the finisher followed with a metal float of sheet metal bent to the proper shape of the curb. He finally dragged the curb with burlap to take off any trace of laitance.

The final finish was given to the surface of the concrete with fiber brooms. The slab was broomed first and then later the curb was broomed, the difference in time being, as closely as possible, the difference in the time of placing of the slab and curb concrete.

Burlap and Chemical Cure

Three men spread wet burlap on the concrete just as soon as possible after the broom finish was complete. The excessively hot summer made the immediate protection of the concrete an absolute necessity to prevent the starting of hair cracks. From one to three men sprinkled the burlap for the full 24 hours it was on the concrete. The burlap was then removed and the surface covered with a solution of sodium silicate at the rate of one pound of the solution from the drum to each square yard of pavement. The solution as applied was diluted with one pail of water for each four pails of the chemical as taken from the shipping drums.

A crew of about fifteen men was used for the placing of the burlap, the application of the sodium silicate and for pulling the forms and banking the shoulder earth against the edge of the pavement. These men placed the forms pulled from the day-old pavement transversely across the pavement to discourage its use by heedless motorists. The empty silicate drums were also lined up to act as barricades.

The shoulders were shaped up with an Austin No. 77S power grader. Where it was necessary to transport earth along the shoulders for short distances the contractor used a Continental scoop pulled by an Allis-Chalmers Model K tractor. For the final shaping of the shoulders and working against the pavement the contractor employed what is probably the best practice and a method that may shortly be specified by many states, namely a pneumatic-tired grader. This Caterpillar 66 was pulled by a Model L Allis-Chalmers tractor. The protection afforded to the edge of the pavement by the elimination of the metal wheels cannot be too highly regarded. After a contractor has been watched so closely by the inspectors on the various operations of placing, vibrating and edging the concrete, then to permit the careless use of an iron wheeled grader to spall the concrete, particularly along the sections where there is lip curb, is needless.

C. & E. M. Photo

Paver and Finisher on the 10-Foot Widening Strip

The contract for the 10-foot widening of 6.429 miles of concrete pavement on U. S. 66 was awarded to the C. H. Atkinson Paving Co. of Chillicothe, Mo., on its bid of $75,318.22. Paving was started on June 3, 1936 and was completed on July 21, working five 8-hour days a week. Murray Windle, Vice President of the C. H. Atkinson Paving Co., was General Superintendent for the contractor on this work and for the Missouri State Highway Department the work was in charge of P. L. Redman, Project Engineer.

Dirt-Moving Costs Cut To the Bone—

WITH a Sauerman Slackline or Drag Scraper you can dig to a depth of several hundred feet, whether in dry ground or under water, and haul the excavated material any distance up to 1500 ft. at a cost of a few cents per cubic yard. Sixteen different sizes with handling capacities from 10 to 600 cu. yds. per hour.

Write for catalog telling all about these money-saving machines.

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THESE guns never miss their mark! They force lubricant, under tremendous pressure to *every* part of the bearing surface. They lick friction on every kind of construction machinery.

Alemite Lubrication shows big gains for contractors in every field. Perhaps the most important is the gain in *machine efficiency*—through bearing failures ended, breakdowns prevented and contract schedules maintained.

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Put these guns to work in *your* War with Friction! There's an Alemite System, power or manually operated, which can meet your requirements exactly. Installation is easy. Cost is small. Work need not be interrupted.

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Conducting Business For Tax Advantage

By WILLIAM H. CROW
Tax Attorney and Co-Author of "Planning for Tax Economy"

Increasing Complexity of Contractors' Taxes Means Thorough Knowledge of Laws Is Necessary

THE problems confronting contractors in common with other taxpayers are numerous and complex, but to add to their worries there are provisions in the Federal and state tax statutes which specifically deal with contractors. This is true of the Federal Revenue Act, the Federal Social Security Act and the state payroll tax laws. Futhermore, under the state tax laws, particularly the state corporation tax laws, and the court decisions thereunder, there have arisen many vexatious problems which directly affect contractors.

In view of the multiplicity of tax provisions affecting contractors' activities, a knowledge of such provisions and of the tax effects of particular transactions or series of transactions is imperative. Not only must unescapable tax burdens be anticipated, but the related penalties resulting from inadvertent omissions or oversights must be duly considered and forestalled. That contracting concerns have been remiss in anticipating the tax consequences of haphazard conduct of their affairs is evidenced by the conspicuous number of cases involving contracting operations to be found in the records of the Bureau of Internal Revenue, the Board of Tax Appeals and the courts. However, contractors are becoming cognizant of the advantages of studying optional procedures, with the object of choosing the course of action which will result in minimum tax payments, realizing that the proper time to analyze and forecast tax elements is before putting operating programs into effect and not after tax liabilities have become definitely fixed and irremediable.

Conflicting Tax Elements

Contractors, in common with other taxpayers, find themselves in a position frequently, in the process of tax analysis and selection, to weigh conflicting tax effects of alternative courses of action. The advantages of one course may be offset by the seeming disadvantages of other courses optional to the taxpayer. A substantial tax saving resulting from a certain program under a Federal tax law may create prohibitive tax liabilities under a different Federal or state tax statute. The process of prevision of tax results may be further complicated by the existence of optional procedures embodying conflicting tax effects under the same statute. Opportunities for pre-determination are not always apparent from the statute or even the regulations. Familiarity with legal rules interpretative of the laws is frequently essential to reveal what the tax status will be, consequent upon a particular conduct of affairs.

In many instances, practical considerations will outweigh tax advantages in deciding policies and programs. The procedure which would result in a lesser tax payment may be quite inexpedient when weighed against practical business considerations.

Having in mind all these elements, it may be conceded that the correct solutions of the multiplicity of tax problems of contractors may involve many complexities and difficulties. It is undeniable, however, that taxes are part and parcel with other problems of contractors. It is necessary to deal with them effectively, as with other elements affecting costs of doing business and the determination of net profits.

Approach to Tax Savings

Contractors and their tax advisers, experienced in the pre-determination of tax effects of optional programs, have developed a methodical approach, comprising a painstaking tracing of cause and effect. The inter-relations of tax consequences to particular acts, transactions and dealings are invariably scrutinized. To assure that the tax position of the contractor at the end of the tax reporting period will be most advantageous requires careful study and verification of all tax aspects.

A method adopted in some instances, and which has proved effective, is to prepare a check list against which each major step in the affairs of the contractor may be carefully checked for tax effects. Although the average contractor may regard such a detailed study as inapplicable to his particular situation and as lying more properly in the province of the tax specialist, in the majority of cases the preparation of such a check list will amply reward the taxpayer. An illustration of a typical "reminder list of tax effects" will be presented in a succeeding article of this series.

(Continued on page 28)

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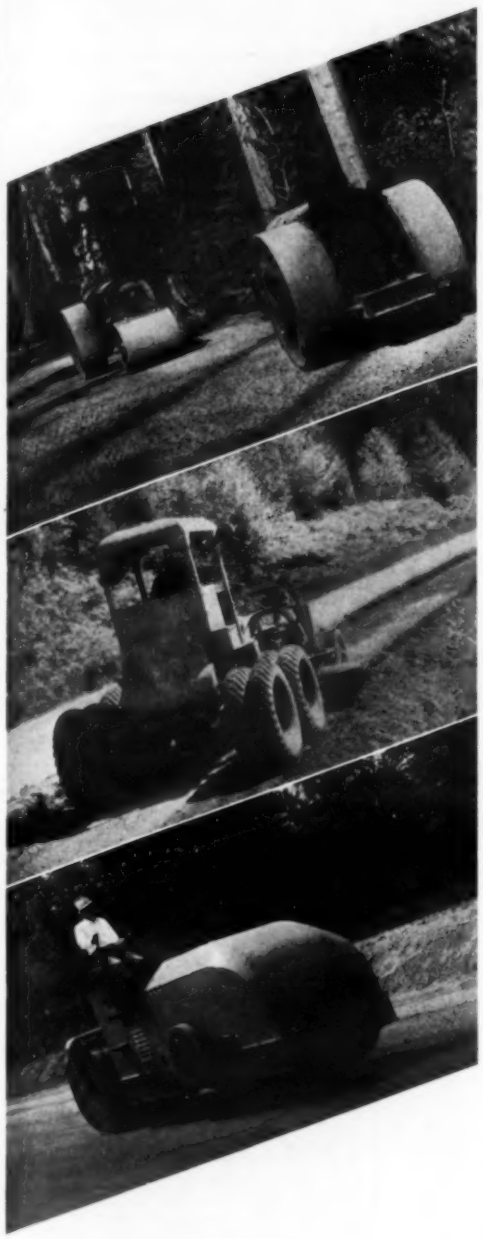

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C. & E. M. Photo

The Boring Rig, Showing the Barrel-Shaped Auger at the Left

An Unusual Experiment In Draining Swamps

(Continued from page 5)

between filled with ¾-inch crushed rock. For the laterals, which are spaced 50 feet apart, the boards are placed 2 feet apart. These laterals connect the drains running along the tops of the piles. The muck removed in forming the piles is used to bank against the drains.

In making the fill the material is spread in 8-inch layers before compaction, watered and rolled to a relative compaction of not less than 90 per cent, in accordance with California's standard method of constructing earth embankments. This will insure thorough compaction of the fill and permit close observation of the dewatering of the underlying material through the drains. The center row of the vertical sand drains is along the center line of the highway where a traffic separation strip is located. This will permit observation of the action of the material both within the piles and outside by sampling with the 1 and 2-inch soil sampling tubes developed by the Soils Laboratory of the Highway Division. Samples of the material at the location of each pile were taken and tested for moisture content as the work progressed. Further tests to be made subsequent to construction will show the amount of dehydration and stabilization obtained by this special treatment of the marsh.

When 2 or 3 feet of fill had been placed, there was a measured water flow of 50 gallons a day from seventeen of the vertical drains which were provided with a piped outlet to the side of the fill. This indicates that the weight of the light fill forced some water out of the muck. A much greater volume of water no doubt will be forced up the vertical drains and out the horizontal drains when the heavier fill load is applied.

The work on the piles is under the direction of T. E. Stanton, Materials and Research Engineer, California Division of Highways with O. J. Porter, Associate Physical Testing Engineer in charge of the field work, assisted by W. E. Peck, Junior Laboratory Aid.

Rebuilding Men

(Continued from page 17)

civil service with the exception of the prison employees such as the guards and commissary clerks.

The family quarters of the free labor are rented by the individual laborer from the camp and the building is located outside the camp limits in all cases. Single free employees may live within the camp limits in a segregated section of the camp away from the line of quarters of the prisoners, wherever possible. The latter are lined up so that the front doors, the only doors, may be seen at all times from the guards' house. This is another example of doing something which discourages escapes from the camp but still does not place such a restriction upon the prisoners that they feel the restraint all the time.

As the costs of the camp are borne by the prisoners, no visitors are permitted to eat at the camp without paying the set sum of fifty cents per meal. This applies to engineers as well as other official visitors. This prevents junkets and also the prisoners have a freedom from the feeling that free folks are sponging on them.

The law permits a maximum net earning of 75 cents per day per prisoner. Any money over this amount reverts to the camp fund. The law also provides for payment of two-thirds of prisoners' net earnings to dependents who are receiving State Aid.

This form of work for the prisoners was created by the state legislature in 1915 but the law was amended in 1923 to create the pay feature and to improve the general conditions. Minor amendments were made in 1935 to clarify the Act further.

A New Clay Digger

Something new in clay diggers has been announced by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. The new No. 401 and 402 Thor clay diggers are equipped with pigtail rubber bumpers. This spiral bumper fits around the shank of the spade as well as inside the retainer, thus forming an effective packing that prevents dirt or gravel from entering. In these models, the lock collar has been entirely abandoned. The handle and barrel in these two types of design are clamped together with two bolts. A new type retainer is used, with a lock, that is not affected by dirt.

The No. 401 clay digger is especially adapted for tunnel work as it is light and powerful. The No. 402 can be used in caissons and large tunnels where the ground is especially hard. It has sufficient power and a chisel point can be used for light demolition work. Both of these Thor clay diggers with ball end butts can be used for vibrating concrete in forms by tamping wood or steel forms.

A new test for road-mix aggregate, supplementing the "swell" test, has been developed by an engineer in Arizona and will be described in our December issue.

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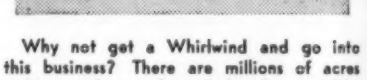

A NEW JOB FOR THE CONTRACTOR

FARM TERRACING IS ACTIVELY IN PROGRESS

About one-third of the States have adopted it. There are still thirty or more states where the program has not started, principally because:—

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The United States Department of Agriculture is urging farmers to build terrace to save the soil and moisture on the land. The farmers need contractors with suitable equipment to build the terraces and maintain them.

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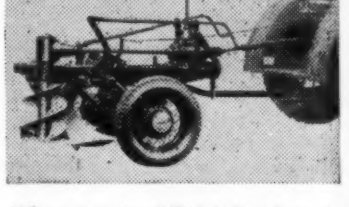

Why not get a Whirlwind and go into this business? There are millions of acres waiting and enough work for the next fifty years.

Get particulars from your local County Farm Agent or U. S. Soil Conservation Service. We maintain a Department and field men who will gladly cooperate.

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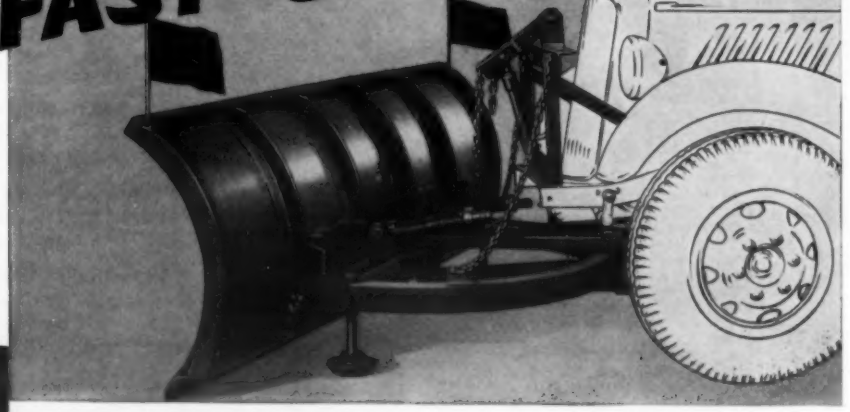

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Here is the first complete discussion of legally permissible tax-saving methods, covering all Federal, state and local taxes, which makes plain to contractors and sub-contractors how to conduct negotiations and operations in order to escape avoidable tax burdens. Numerous examples are presented, enabling the reader to find a precedent for the problem at hand. An oversight of one of the numerous tax saving procedures described in the book might result in a very substantial amount of avoidable expense.

PLANNING FOR TAX ECONOMY

Is a reservoir of practical experiences in approved tax-saving methods. The authors, William H. Crow and Urban S. Greene, an attorney and an accountant, with backgrounds covering over 20 years of professional specialization in tax matters, have assisted in solving numerous tax problems confronting highway contractors and those engaged in heavy construction. Supplements covering tax savings in respect to Federal Income and Social Security and the State Payroll Acts will be published from time to time and furnished to purchasers of this book at a nominal price.

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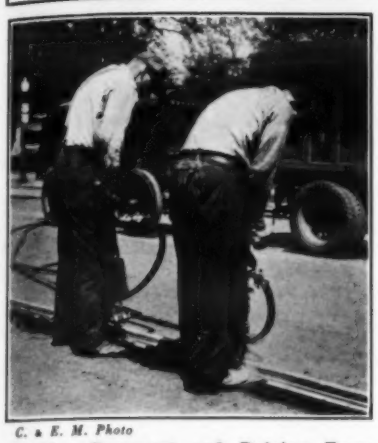
How the Other Fellow Did It

Ideas Which Have Already Proved Helpful to Contractors



C. & E. M. Photo

Drilling Pavement and Driving Form Pins with Jack Hammers

Jack Hammers Save Time in Driving Form Pins

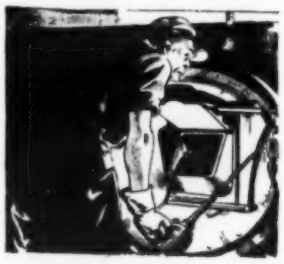
391 While resurfacing a brick pavement with hot-mix in Ohio last season, a contractor found that driving the form pins through a standard brick pavement is not an easy job, so he used a scheme which he had developed previously to meet the same problem in resurfacing a macadam road.

A 220-foot Ingersoll-Rand compressor mounted on a trailer was pulled along the line of forms and two lines of hose connected to the pneumatic machines. The first was a standard I-R jack hammer which drilled a hole through a pavement, using the pin hole in the form as a jig, and then the second machine, a jack hammer with a short length of drill steel forged to fit the top of the pins, drove the pins down just below the level of the top of the forms.

When this method was developed by the contractor, he had eight men working for all they were worth and then could not keep the forms ahead of the finishing machine. The jack hammer twins then came into being and now two men do the trick. 549:35

Scarifier Teeth Toughened

392 Tearing up a heavily packed gravel road preparatory to resurfacing wears out most steel scarifier teeth in a few hours. On an especially tough job in Michigan, where the teeth became useless within four hours, the contractor tried hard-facing. Teeth protected by a wear-resistent cobalt-chromium-tungsten alloy were only one-half worn after 20 hours of this severe service.



On the skilful check of the minutest details hangs life and death . . . **Protect against Tuberculosis by checking your health.**

BUY Christmas Seals 1936

The National, State and Local Tuberculosis Associations of the United States

Curing Concrete in Desert Heat

393 In constructing the Fan Hill siphon, on the Colorado River Aqueduct, several methods of air fogging were tried within the finished transition sections, with a view to securing the best results with the use of a minimum of water, which naturally must be conserved in that desert region. Following is the method finally used.

Numerous small jets were threaded into a 1-inch pipe line, which was suspended 2 feet below the ceiling of the finished sections, after they were bulkheaded off with canvas to keep out air currents. With a water pressure of 80 to 87 pounds the jets were opened on 2-foot centers and run constantly for the first 72 hours. For the next four days the jets were open on 4-foot centers constantly. Then for 48 days the jets were open on 6-foot centers, with water on ten minutes and off thirty minutes. The spray hit the ceiling, filled the air and trickled down the sides, maintaining a humidity of 95 to 97 per cent.

Bulldozing Clay Fill Up to Secure Better Compaction

Building Fill by Boosting

394 Dump Truck Service, Inc., Buffalo, N. Y., had a subcontract for an addition to a new steel plant being erected near Buffalo. The fill was made of clay dumped from motor trucks along the base of the fill and then it was worked up into place by a TracTracTor and an 8-foot bulldozer. The tractor was operated at a cost of 18 cents an hour for fuel and lubricating oil. This is quite the reverse of the usual use of a tractor in bulldozing material dumped on the top of the fill. The method used was believed to give better compaction with the clay which was used to make the fill. IH:36

Gas Heater for Shop

395 A section of an old steel tank, with several arched sections cut from the bottom end for ventilation, and slots cut in the top, makes a cheap and efficient gas heater for garage or shop. Cross bars are welded inside, several inches from the bottom, and a common gas burner installed at this point, with the valve held firm by two outside braces welded on. Fire bricks are placed on the cross bars to hold the heat longer. A small door is cut in the side near the top, so that the device may also be used to burn waste papers, etc.

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   Faster travel, easier control, better mobility in these tractor-type crawlers of universally approved design.
2. ***Welded Frame of high tensile steel***
   Cylindrical car body with X-frame is welded integrally with the corduroy frames of alloy steel channel for greater strength and lightness.
3. ***Helical-geared hoist mechanism***
   Smooth, quiet, power transmission with all helical hoist gearing fully enclosed, running in an oil bath for long life.
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   The upper revolves on a huge roller bearing. Double swiveled rollers at the back take up all tipping strain for easy swing with full dipper loads.

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P&H PACEMAKERS—FASTER ON THE JOB

Tax Problems

(Continued from page 24)

Permissible Tax Saving Plans

It is important for the taxpayer, in selecting methods of transacting his business which will insure minimum tax liability, to distinguish between those methods which are legally permissible and those which are prohibited by law. Judge Learned Hand has stated in the course of his opinion in Gregory v. Helvering, subsequently affirmed by the United States Supreme Court, that "there is not even a patriotic duty to increase one's taxes." The case has been frequently quoted on the principle that transactions authorized within the provisions of the tax law do not lose their immunity because the taxpayer is actuated by the desire to avoid the payment of income tax. In that case a taxpayer owning all of the stock of a corporation effected transfer of some of the corporation's assets to a new corporation, wholly owned by the taxpayer and created for the purpose of reducing taxes of the taxpayer by issuing transferred assets to the taxpayer as a liquidating dividend. The court held that the transaction did not constitute a "reorganization" within the statute exempting from tax gains from distribution in pursuance of reorganization. Judge Hand said: "We agree with the Board and the taxpayer that a transaction, otherwise within an exception of the tax law, does not lose its immunity because it is actuated by a desire to avoid, or, if one chooses, to evade taxation. Anyone may so arrange his affairs that his taxes shall be as low as possible; he is not bound to choose that pattern which will best pay the Treasury; there is not even a patriotic duty to increase one's taxes."

In an early decision of the United States Supreme Court, U. S. v. Isham, the doctrine was affirmed that "if a device is carried out by means of legal forms it is subject to no legal censure." In general, courts have upheld the proposition that where a procedure is bona fide and executed by legal means, the mere intention to minimize tax payments will not affect its validity.

Unlawful Evasion

In contra-distinction to lawful tax avoidance are shams or artifices which constitute a violation of the express provisions or the spirit of the statute. Instances of such prohibited artifices are dummy transfers, devices for concealing or withholding assets, earnings or income, or omissions or falsifications in books of account.

An illustration of illegal evasion by the use of artifices definitely prohibited under the decisions of the courts is the attempt to evade the unemployment insurance or payroll tax laws by the establishment of fictitious partnerships or "subcontracts," thereby constituting both in fact and in law false representations of the relationships of the parties. In such cases the fictitious relationships are no more than shams and the true status and relationship of employer and employee continue to exist.

Evasion by Contracts

Under certain circumstances the execution of contracts has been held to constitute evasion. In such instances the use of contracts was deliberately planned for purposes of evading taxes, and had no justification in ordinary commercial procedure. Probably a majority of the cases of this type relate to agreements between affiliated corporations. However, the principle is extended to embrace agreements between independent corporations where the agreement was entered into purely for the purpose of defrauding the government. Contracts between long established and independent corporations, however, do not call for the same scrutiny by the tax authorities as those entered into by affiliated corporations or between parent corporations and newly organized subsidiaries.

The test is whether the agreement is bona fide, consistent with ordinary commercial practice, or whether it constitutes a fraudulent device used to evade taxes. In such a case the contract will be disregarded by the government and the courts, and assessments will be made on the true basis, irrespective of the agreement.

Pre-Organization Tax Problems

Even before the establishment of a new business, the projectors of a contracting enterprise are confronted with the necessity of forecasting the tax effects which may result from the choice of the form of organization under which the business will be conducted. Whether to carry on the new business as a proprietorship, partnership or corporation may be directly affected by the tax consequences of the selection. The tax burdens will vary in accordance with the form of organization. Careful study of all of the elements pertaining to the business, including the tax effect, must be made in order to determine which type of organization will result in the greatest tax advantage to the projectors. Such incidental problems as the comparative tax advantages of incorporating under the laws of one state as contrasted with that of another, the predetermination of capital structure, the tax consequences of having par value or no par value stock, and of considering whether or not the concern will do business in other states than that of organization are all pertinent points influencing the extent of ultimate tax payments.

Relation of Payroll Taxes to Organization Form

Although at first glance the influence of taxes imposed for unemployment insurance upon the form of organization might seem to be very remote, nevertheless such an influence may exist. Under the definitions of the Social Security Act the term "employee" is defined to include an officer of a corporation. Assume, therefore, that the number of employees after organization of the corporation is less than the statutory minimum (eight employees under the Federal Social Security Act, and varying minimums prescribed under state laws, as, for example, four in New York State) by the number of officers actually engaged in the business carried on by the corporation. The effect of incorporation will therefore be, under existing Federal and state laws, to make the new organization subject to the Federal or state payroll taxes.

On the other hand, if the business is conducted as a proprietorship, the withdrawals of the proprietor are those of an employer and not of an employee. Therefore his services would not be taken into account in determining the number of employees prescribed by Federal or state payroll tax laws.

The Federal Social Security Act does not contain any reference to partners in these definitions. Under state laws or regulations issued thereunder, members of partnerships, whether with or without drawing accounts, are not to be regarded as performing services within the meaning of the term "employment." Partners are therefore not to be included among the number of employees in determining whether the number reaches the statutory minimum prescribed for bringing the business within the terms of the Act.

Voluntary Assumption of Liability

Unlike the prevailing custom on the part of taxpayers of seeking to avoid tax liabilities, it may sometimes be considered advantageous by the taxpayer to assume such liability. In the case of a small contractor not subject to unemployment insurance, because of having less than the minimum number of employees or because services of employees are used for less than the statu-

(Continued on page 33)

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Building Sewer Tunnel Under Air in New York

(Continued from page 8)

of concrete lagged about 8 feet behind the invert.

Concreting

Throughout the operation ready-mixed concrete supplied by the Colonial Sand & Gravel Co. from a plant about one mile distant from the shaft was used. This concrete was delivered to a hopper at the elevation of the street and then chuted through an elephant trunk to a 1-yard hopper in the bottom of the shaft. A ½-yard Cuthbertson concrete blower operating at 100 pounds pressure, delivering the concrete through a venturi-type plug cock to a 6-inch steel pipe with Dresser couplings, supplied the concrete to the gang working at the forms. The invert concrete was placed through a slotted hole in the 6-inch pipe and for the arch a rubber tube attached to flattened pipes varying from 8 feet to 2 feet in length was used.

Delivery of the concrete from free air by the Cuthbertson machine was controlled entirely by a red light signal system operated by the concrete crew under air. Water accumulating in the heading was removed by blow pipe pumping to free air. Other utilities run through the tunnel included the 6-inch air line, the 6-inch concrete line and a telephone conduit as well as electric wires for lighting.

Personnel

Work on this tunnel section, which is part of the Wards Island Sewage Treatment Works, was carried on by the contractor, Rodgers & Hagerty, Inc., New York City, under the supervision of John J. Hagerty, General Superintendent and Works Manager, with Frank W. Allen, Chief Engineer, David Bonner, Construction Engineer, and William Kauffman, Field Engineer. Harry Redwood was Superintendent on this operation. For the City of New York the project was under the direction of William F. Carey, Commissioner, Department of Sanitation; Walter D. Binger, Deputy Commissioner in charge of engineering and construction; Richard H. Gould, Chief Engineer, Sewage Disposal and Intercepting Sewers; Herbert M. Hale, Engineer of Construction, Ward's Island Project, and Leonard Johnson, Resident Engineer.

A New Elevator Belt

The U. S. Bucket Belt, a new addition to its line of elevator belts, has recently been announced by the United States Rubber Co., Mechanical Goods Division, 1790 Broadway, New York City, for use in handling light stone, sand and similar materials.

The U. S. Bucket Belt has a specially designed 32-ounce duck body and high grade cover to meet field requirements and serves as an intermediary belt between the heavy-duty and light-service elevator belts.

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Fire Proof—Oil Burning
Hand and Motor driven spray. Many sizes. Write for catalog.
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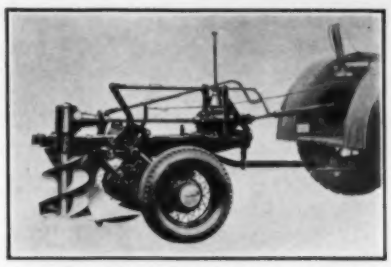

Parsons Model W Whirlwind Terracer

A New Type of Work For Local Contractors

Terracing is one of the most important features of soil erosion control and is perhaps being stressed more than any one other phase of control measures. Terracing has been done in the past with plows and graders but last fall a new machine designed particularly for this type of work was exhibited for the first time by the Parsons Co., Newton, Iowa. The Parsons Whirlwind Terracing machine consists of an 18-inch moldboard plow, a 14-inch rotator to throw the dirt to the side, a 3-speed gear box to provide low, medium and high speeds for the rotator, power take-off connections to the tractor and a sturdy frame supported on two pneumatic-tired wheels.

After a terrace line has been surveyed, the driver of the tractor pulling the Parsons Whirlwind plows a furrow on the center line of the proposed terrace, traveling at relatively slow speed and with the rotator in the low speed so that the dirt will simply be moved over. At the end of the terrace line, the tractor is turned and the same procedure is followed back so that the two furrows are turned towards each other. The line of the two furrows will be the center line of the terrace when the grade has been raised to the proper height. This plowing continues back and forth further from the center line at each trip and traveling at higher speeds and with a higher rotator speed on each trip.

A 15-30 horsepower rubber-tired tractor handles the machine nicely. The frame of the Whirlwind is made of one piece and the transmission rotor drives and axle of the larger size, Model W, have been strengthened over the original machine.

Local contractors with one of these machines can figure their costs closely and take contracts on a linear foot basis for building soil conservation terraces on large farms in the drought area.

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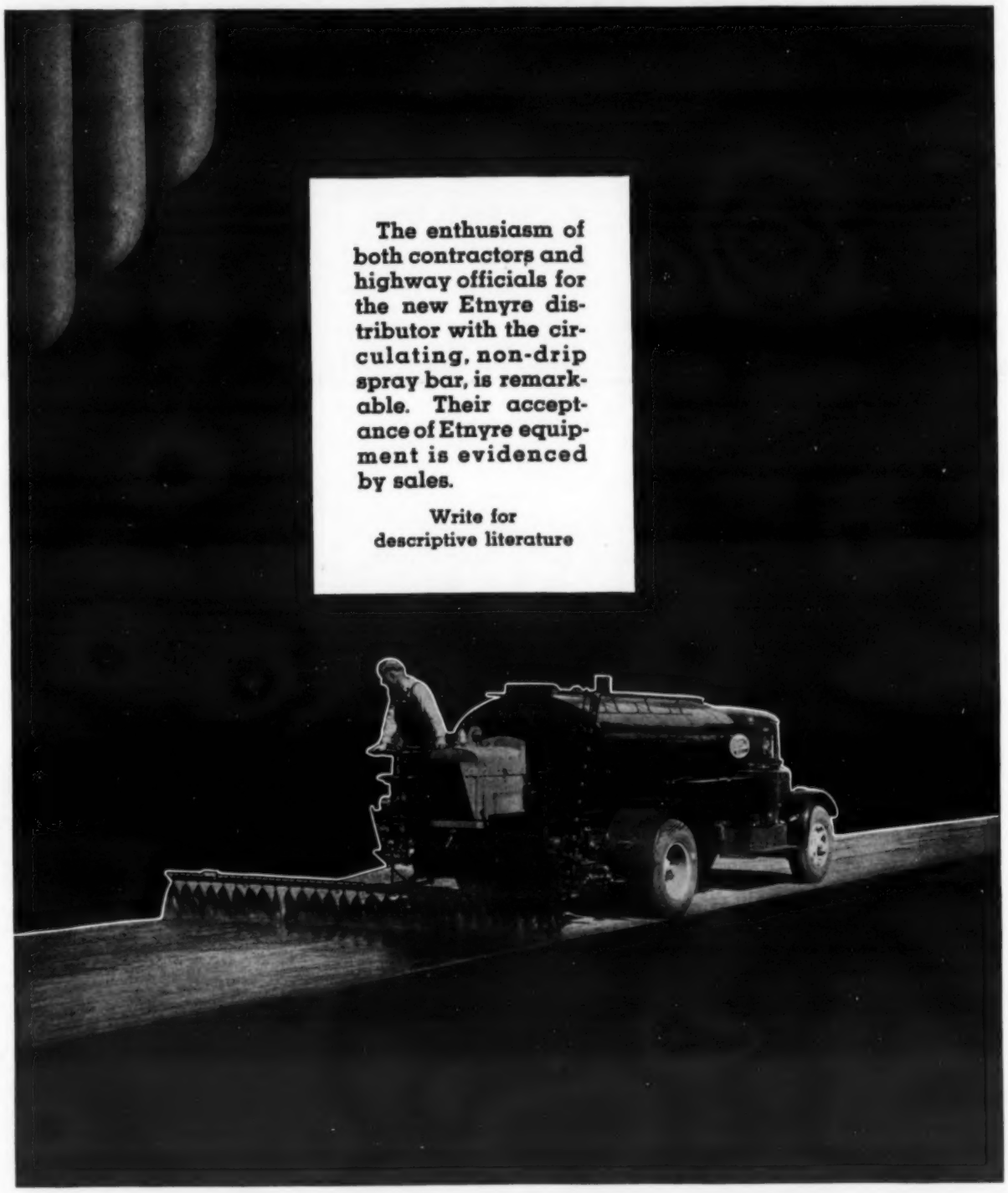
The enthusiasm of both contractors and highway officials for the new Etnyre distributor with the circulating, non-drip spray bar, is remarkable. Their acceptance of Etnyre equipment is evidenced by sales.
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Drives for Head-Towers Of Bonneville Cableway

By DAVE WILLIAMS,
Superintendent of Cableways, Columbia Construction Co.

OVERHEAD cableways are used by the Columbia Construction Co., which has the major contract on the Bonneville dam, power and navigation project at Bonneville, Ore., for handling the materials, steel, and concrete, needed in the construction of the dam, between Bradford Island, in the middle of the Columbia River, and the Washington shore. These two cableways, each of 20 tons capacity, with a span of 2,022 feet between towers, are both anchored to a single fixed tower on the Washington bank and, to provide access to all parts of the work, to movable head towers at the other side. These movable towers operate independently of each other on a common bank of tracks, and travel over a distance of approximately 850 feet in an up and downstream direction, the tracks being laid on a radius to permit operation about the fixed tower as a radius point.

Original Installation

These movable head towers, as originally installed, were propelled by means of an independent hoist mounted on each head tower. Anchors were placed at the extreme end of the track runway. A cable 4,600 feet long, 1 inch in diameter with an independent supersteel wire rope center, was required to reeve five parts of cable between the east anchorage and the east side of the east tower, after which five complete turns were taken around the concave drum on the moving engine which was mounted on the west side of the east tower. From there five parts of line was reeved up between the west side of the east tower and the east side of the west tower, after which five turns were taken around the moving engine which was mounted on the west side of the west tower and five parts of line reeved between the west side of the west tower and the west anchorage. The main part of this cable which went over the concave drum of the independent moving engine was subject to a very severe abrasion, the maximum life of the cable being 1,205 hours.

The maintenance cost of this cable drive was extremely high, not only because of the necessary replacement of the cable itself, but also because both cableways were put out of operation while a new cable was being installed. This was a very important factor as the cableways are the key equipment for the transportation of the materials which go into the building of the Bonneville dam. As the job had to be constructed during the low water stages of the Columbia River, it was very important that every piece of equipment and every man be tuned up to the highest degree of efficiency for the short working season.

New Truck Drive Installed

In view of this situation, a dual truck drive was worked out by the author, who is in charge of rigging and cableways for the contractor, to replace the cable traveling mechanism, and the change-over on both towers has been completed under his direction.

The following equipment, purchased from the Link-Belt Co., was installed. A 125-hp hoist type motor is connected to a squaring shaft by means of an encased silent chain drive located at about the center of the squaring shaft, which is in two sections, connected by means of a Link-Belt RC type flexible coupling, to allow for any possible deflections in the structural steel tower framing. From each end of the squaring shafts, gears give the desired reduction in speed to a jack shaft carrying a double width RC-D250 2½-inch pitch roller chain drive for the rear truck, and a triple width RC-E250 drive for the front truck. These chains each drive to a lower truck drive shaft, on which is mounted a spur pinion engaging gears on the two truck axles applying power to four wheels on the front truck and four wheels on the rear truck.

The head towers are structures of considerable size. The chain drive provides a satisfactory and positive connection between the main frame and the trucks, on relatively long centers, and at the same time provide a sufficiently flexible connection to take care of some variation encountered due to minor differences in the level of the tracks.

Alloy steel shafts and cut-tooth alloy steel gears are used entirely and in addition to the Link-Belt Silverstreak silent chain drives and heavy-duty angle bearings, rigid bearings and malleable iron safety collars are among the items assembled with the equipment.

This chain and gear drive has been in operation since the latter part of June and up to the time of writing has operated without a minute's delay. The maintenance cost has remained practically nil as it requires only ordinary lubrication.

Saving of Money and Time Effected by Change to New Roller Chain Drives

Depressed Freight Car Carries Roller Gate Drums

Since cargo for a construction project cannot duck a low bridge, particular care in shipment is necessary. When the Leetsdale plant of the Bethlehem Steel Co., near Pittsburgh, starting shipping out the twenty end drums for the roller gates in Mississippi Flood Control Dams No. 5A and 7, it was necessary to use a depressed freight car furnished by the Pennsylvania Railroad.

Squaring Shaft, Speed Reducing Gears, Jack Shaft and Double Width Roller Chain Drive for Rear Truck of the Cableway Head Towers at Bonneville

The over-all diameter of the two types of drums included in the shipments to Winona and Dresbach, Minn., was 16 feet 8 inches. As loaded on the depressed cars each cargo measured 19 feet in height from the top of the rails. Getting the drums to their destination was mostly a problem of working out a route that had no bridges or water spouts low enough to interfere with their passage. Only one such route could be found which was as follows: Pennsylvania Railroad via Conway, Pa. to Salem, Ohio; over main track only under Main Street Bridge to Alliance, Ohio, to Crestline, Ohio, and Adams, Ind.; then to Ridgeville, Ind., Logansport, Ind. En route it was necessary to remove the water spouts at Lake Ciecott, Ind., and the water spouts at Remington and Effner, Ind., had to be pulled to their highest position. At Effner, the cargo ran over the tracks of the Toledo, Peoria & Western Railroad to Webster, Ill., for delivery to the Chicago, Milwaukee, St. Paul & Pacific Railway via that line to Joliet, Ill., for delivery to the East Jordan & Southern Railroad. This line moved the cars to Spaulding, Ill., for re-delivery to the Chicago, Milwaukee, St. Paul & Pacific Railway and thence to their destination. Movement was restricted to local train service at a speed not exceeding 30 miles an hour.

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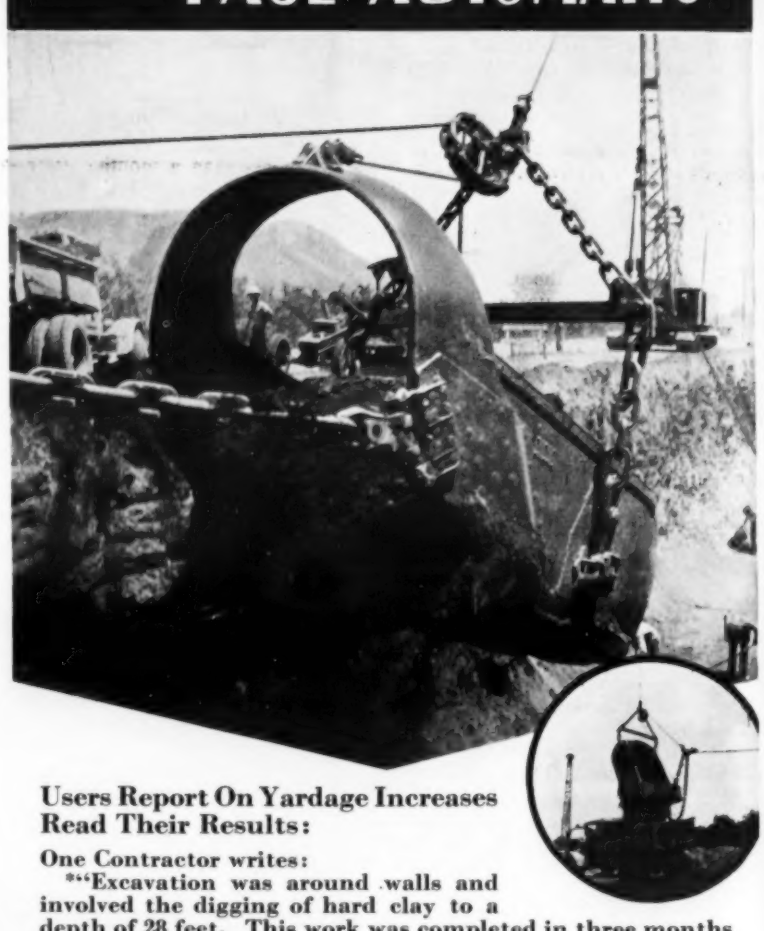

Users Report On Yardage Increases Read Their Results:

One Contractor writes:
***"Excavation was around walls and involved the digging of hard clay to a depth of 28 feet. This work was completed in three months—one-half the time we figured necessary."**

Another AUTOMATIC owner reports:
***"We are stripping 25' overburden, some of which is hard pan and rock. Since putting on the AUTOMATIC we are stripping at least 50% more material."**

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Lancaster County Finds "Pay As You Go" Best Plan

(Continued from page 15)

the tools, including a blacksmith shop, necessary to do all of the work, except some highly specialized lines of work. A store room in conjunction with the shop holds a large supply of tools, parts and hardware.

The personnel at the county shop includes a foreman, five mechanics, a storekeeper, blacksmith and bookkeeper.

A spur track runs into the shop yard where carloads of lumber, piling, gasoline, etc., are unloaded and stored. A gasoline storage capacity of 33,000 gallons is at the shop yard. Gasoline and oils are hauled to the patrol stations in a tank truck.

All patrolmen, mechanics, truck drivers, etc., are required to keep daily reports. Inventories and records of everything used are accurately kept and yearly cost records are made up for all equipment.

How It Works Out

This organization permits the county to put thirty-three outfits to dragging roads immediately after a rain and with some twenty snow plows, both large and small, at the patrol stations, to open all of the roads in the county in three or four days when the drifts do not exceed three or four feet in depth. The snow of January and February of this year was a different proposition, but it was eventually whipped.

The personnel of this organization consists of a superintendent of maintenance, thirty-three full time patrolmen, paid a monthly salary, and eight second patrolmen who are employed about eight months of the year.

Some of the outstanding features of Lancaster County's maintenance organization are:

(1). The maintenance of all of the roads in the County under the control of one officer; (2). Only one fund from which expenditures are made, the Highway Fund; (3). No levy on property for roads, no bonded or outstanding indebtedness; (4). Better roads.

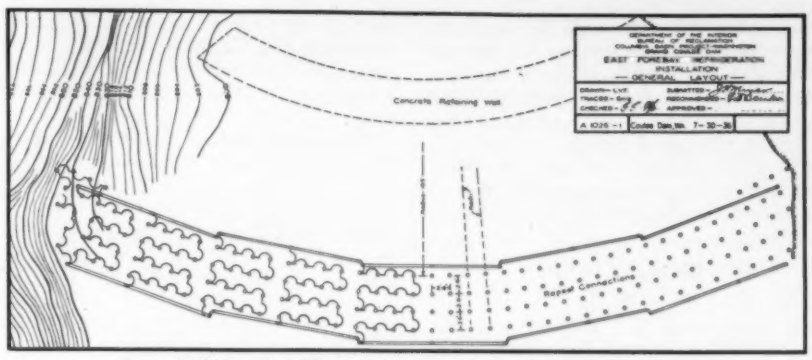
Koppers Reorganization

The name of Koppers Gas & Coke Co., Pittsburgh, Pa., has been changed to Koppers Co. and its three subsidiary companies are being dissolved and will become divisions of the parent company. These include: The Koppers Construction Co., which becomes the Engineering and Construction Division; Koppers Products Co., which becomes the Tar and Chemical Division; and The Bartlett Hayward Co., which becomes the Bartlett Hayward Division.

The Western Gas Division of The Koppers Construction Co. becomes a division of Koppers Co., as does the American Hammered Piston Ring Division of The Bartlett Hayward Co. The Maryland Drydock Co., The White Tar Co. of New Jersey, Inc., and The Wood Preserving Corp, remain as subsidiaries.

Officers of the former subsidiaries will become officers of the parent company. To avoid similarity of titles, the name of The Koppers Co., parent company of Koppers Co., will be changed to Koppers United Co.

Activities of Koppers Co., through its subsidiaries and divisions, include the designing, construction and operation of by-product coke plants, gas producers, tanks, holders and other gas apparatus, wood preserving plants, and dry docks, and the production and sale of motor benzol, ammonium sulphate, naphthalene, phenol, Tarmac road materials, roofing products, tar acid oils, pitch and other coal tar products, machinery and steel mill equipment, piston rings and packing.



Layout of Freezing Pipes at the Toe of the Grand Coulee Dam

Freezing Tried to Stop Grand Coulee Landslide

(Continued from page 9)

Dayton-Dowd circulating pump is used, driven by a Western Electric 10-hp motor. There are two welded steel cylindrical brine coolers of 40 tons capacity each, and the insulated surge tank receiving the brine from the return is of wood.

Testing Freezing Pipe System

When the freezing pipes had been driven, since they are all of two lengths coupled together, it was necessary to test out the couplings for leaks. Therefore, before putting on the tees, the pipes were all capped once more and tested, under 100 pounds air-pressure from the air system serving that part of the area. A gage was fitted to the top of each cap and the test was to see if the pipe would hold the pressure for five minutes. If the pressure dropped it indicated a leak at the coupling between the two lengths of pipe. The pipe in that case was pulled and the fault remedied.

Work was started on this refrigeration system about August 10 and it was in operation less than a month. Its cost, in the neighborhood of $20,000, is not a great deal in view of the costly problem which this slow-moving but ponderous slide presents. There is every probability of its ultimate success, though more time is necessary to be sure, since conditions are changeable. Anyway, it is holding the slide now, which is a very strong point in favor of the plan.

This method of retaining the moving overburden was suggested by the Bureau of Reclamation and the designs and responsibility for the experiment were also by the Bureau, for which F. A. Banks is Construction Engineer in charge of the Grand Coulee-Columbia Basin Project. J. H. Miner is Office Engineer and A. F. Darland, Field Engineer.

New Heavy Duty Cleaner for Machines, Guard Rails

A new and larger Hypressure Jenny, Model E, has been announced by Homestead Valve Mfg. Co., Coraopolis, Pa. It utilizes a mixture of vapor, hot water, soap or a selected chemical, and pressure. The unit contains its own fuel tank, water and solution tanks, oil burner, and vapor generator. For operation it requires only a water line to the water tank and an electric connection.

Model EH permits two operators to work simultaneously from the one machine. It is designed to break up accumulations of grease, dirt or whatever material is being removed. The flushing action of the spray washes away the loosened accumulation.

Earlier models have been used by the Washington, West Virginia, Arizona and other state highway departments in cleaning guard rails, center lines of highways, and bridge abutments. Many contractors and rental companies use this method of cleaning dirt and grease from tractors, scrapers, mixers, trucks and similar equipment.

The report of the Registrar of the Contractors' License Bureau of California showed that 26,234 licenses were issued for the fiscal year that ended June 30; that 21,225 of these had been renewed by June 30, with 113 delinquent renewals filed by July 23. During the first 23 days of the year, 928 original licenses were also applied for.

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Rapid Progress at Guntersville Dam

Great TVA Project On Tennessee River in Alabama to Impound 886,000 Acre-Feet of Water Will Be Completed in 1940

PROBABLY the most famous river in America today is the Tennessee. For throughout its entire course from its headwaters in the southern Appalachians near Knoxville, Tenn., thence southward into Alabama and bending northward again into western Tennessee and western Kentucky and its confluence with the Ohio at Paducah, the Tennessee is the scene of the great projects of the TVA.

Recent among the projects in this gigantic development scheme is the Guntersville Dam now under construction, 9 miles downstream from the town of Guntersville, Alabama, at a river bend known locally as Cole's Bend Bar. When completed, this dam will provide 9-foot navigation for the ensuing distance of 82 miles to Hale's Bar Dam and will mark the most southerly dip of the Tennessee River, where it hairpins sharply around a mountain tip to start its northwesterly flow to the Ohio Valley.

Of the $330,000,000 estimated as the tentative cost of the TVA, $29,000,000 will be spent in the construction of this dam. It will have an overall length of approximately 4,000 feet and consist of two earth-filled sections, one on either side of the river; a concrete spillway section connecting them; a power house foundation 340 feet long; and a single lift lock to accommodate the passage of river traffic. This lock will have a maximum lift of 45 feet, operating against a maximum head of 42 feet. Normal lift and normal head are 42 and 38 feet respectively.

The length of these various dam sections which make up the total of 3,980 feet will be 847.5 feet of concrete spillway in the center; a 1,760-foot earth-fill section on the southern side and a 705-foot earth-fill section on the north side. The balance is accounted for by the lock construction and intake structure for a future power house. The navigation lock is on the north bank and its chamber will be 360 feet long by 60 feet in width. The maximum height of the dam will be 89 feet from foundation to gate-operating platform. Both north and south earth-fill sections will rise 40 feet from base to crest. The concrete spillway spanning the main channel of the river will be topped by eighteen two-section gates 40x40 feet in size.

A power house, to be built later, upon the foundation provided for in this project, is not included on the $29,000,000 appropriation, but this figure does include the construction of 4 miles of government highway connecting the dam with the Gadsden-Huntersville Highway, which is U.S. 241.

The reservoir behind the Guntersville Dam will have a normal capacity of 886,000 acre feet of water, flooding an area of 99 square miles.

Labor

The number of men necessary to complete this work in the allotted time has not at present been accurately estimated, but camp facilities for the operating staff and the army of workers have been erected, consisting of ten permanent houses, extensive quarters for lock tenders and dam operators, besides twenty temporary houses and nine large dormitories for staff and laborers. Some idea of the estimated man power can be arrived at through the establishment of a cafeteria seating 250 persons and with a capacity of 3,000 meals a day to provide for the feeding of the preliminary crew now at work. A community recreation building, a hospital, and office facilities are also provided, as well as the usual structures for construction needs and maintenance of equipment.

Status of Work

To date, the cofferdam for the lock has been completed and the concrete is now being placed. The north earth-fill section leading up to the lock has also been completed and a crew is now at work on the southern fill. Beneath each earth-fill section is a steel sheet piling cut-off wall driven to bed rock. That portion of the earth fill extending north from the lock will require 140,000 cubic yards, while the south side fill will require 293,000 cubic yards of earth with an additional 70,000 yards of backfill against the power house section. Riprap consisting of broken limestone rock will be used to surface these earth fills in order to resist both water and erosion. Ability to obtain all materials for both fills and riprapping in the immediate neighborhood was largely responsible for the selection of this particular location for the Guntersville Dam.

These ideal conditions at this particular site arise from the fact that the last of the mountains marking the southern extremity of the Cumberland Plateau give way at this point to fertile, alluvial plains, and in the bed of the river there is a hard foundation of Bangor limestone. Into this rock river bed the anchorages for the navigation lock, concrete spillway, and the power house foundation will be sunk. While the mountain on the northern bank forms an ideal quarry for the riprap necessary to the anchoring and the protection of the earth-filled sections of the dam, the alluvial silt loam of the bank is equally ideal material for the earth embankments. The haul for the latter averaged 1,600 feet for the north bank.

Excavation

Excavation in the navigation lock area and the erection of the north embankment were carried on at the same time. About 141,000 cubic yards of earth was removed from the lock area at an average rate of about 3,300 cubic yards every 24 hours. Some of this material went into the north embankment. Rock was displaced at the rate of about 700 cubic yards a day. About 16,000 cubic yards of rock were moved. Eight Ingersoll-Rand drills, one 1¼-yard Northwest power shovel, and one 2½-yard Marion shovel did the work in the lock area. Five Linn crawler trucks and four White dump trucks hauled the material away.

The major part of the material for the north earth-fill section came from borrow pits. One Adams elevating grader, towed by an RD-8 Caterpillar tractor, loaded seven 10-yard Euclid Trac-Truks on this job, while three RD-8 Caterpillars with bulldozers spread the fill on top of the embankment. Two Caterpillar Fifty tractors towed three sheepsfoot rollers for compacting the fill.

Stripping operations got under way early in October on the south side of the river in preparation for the erection of the earth embankment. One 1-yard Osgood shovel is clearing the way, and a Clyde whirley is driving the steel sheet piling for the cut-off wall that will extend under ground the length of the embankment. The Adams elevating grader and the seven Euclid Trac-Truks will be transferred to this part of the job.

Water in necessary quantities for the job is provided by pumping from natural supplies, immediately available. The raw water is pumped from the river itself into a reservoir on the mountain side and carried to the plant and dam through a 9-inch pipe, while the sanitary water is obtained from a natural spring from which it is piped directly to a camp reservoir.

There will be very little rock work compared to that necessitated on the Norris and Chickamauga Dams, according to the engineers. Most of the rock work will be done on the river bed for the foundation of the lock, spillway, and the power house foundations. Little, if any, will be required in the abutment fills at the ends.

Personnel

To date, outside of initial delay due to the high spring floods, the project has proceeded with uninterrupted speed. Much of this speed is due to the fact that the personnel, not only the engineers and superintendents in charge of the job, but many of the workmen as well, come directly from somewhat similar dam-construction projects included in the general scheme of the TVA development. The engineer in charge is Verne Gongwer, Project Engineer, whose office is at the dam. George K. Leonard is Construction Engineer; H. M. Broadfoot, Assistant Construction Engineer; B. F. Philbrick and A. W. Sherman, Assistant Construction Superintendents; Ellis H. Morgan, Field Engineer; R. H. Boyd, Project Personnel Manager; and C. C. Collum, Office Engineer.

When completed in 1940, TVA officials predict that the power developed, the flood control provided, and the rural electrification advantages supplied by this Guntersville Dam will be among the most effective in the Tennessee Valley.

Unskilled Labor Erects Metal Culvert Speedily

(Photo on page 36)

The arch culvert shown on page 36 was built by Kile Killman on Indiana State Route 250, west of Mitchell, Ind.

The contractor purchased the Armco MultiPlates and erected the entire metal culvert in 140 man-hours with unskilled labor which had never done this type of work before.

The culvert is 77½ feet long, has a 14-foot span and a 7-foot rise. The construction of this metal culvert permitted grading to proceed uninterrupted, without delays for the setting of concrete.

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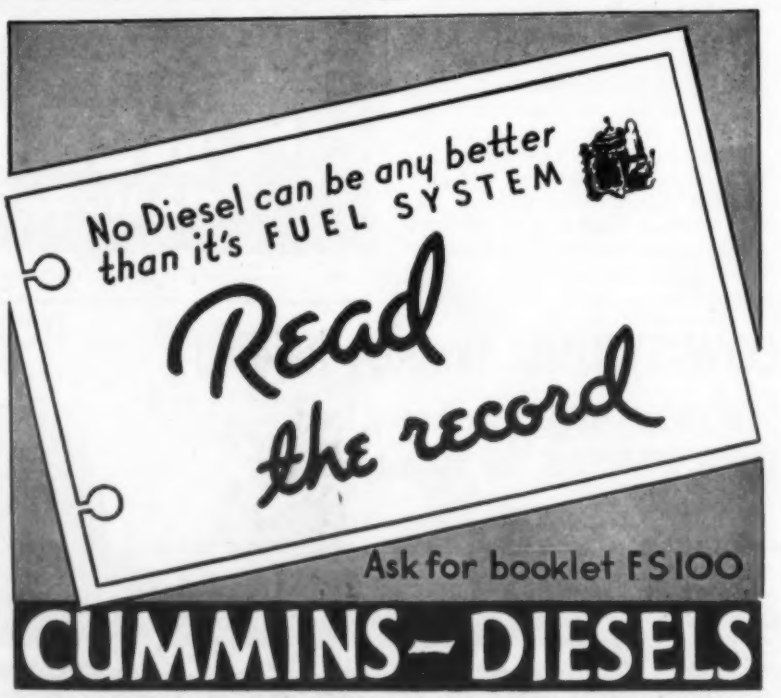
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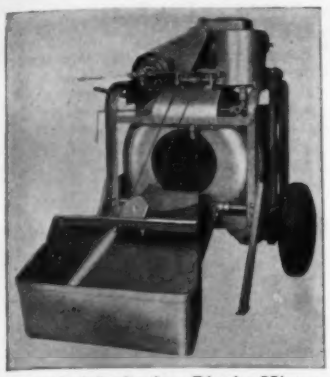

The Knickerbocker Pippin Mixer

The New 5-SE Mixer Is Easily Portable

The Knickerbocker Pippin 5-SE mixer, made by the Knickerbocker Co., Jackson, Mich., is designed for light weight, strength, stability on the job and easy towing. It is so constructed that it is easily transported behind a truck from one job to another and, when there, is easily backed up to foundation forms, sidewalk or culvert for chuting the concrete direct to place.

This mixer has an overall height of 78 inches, a drum diameter of 40½ inches, a 20-inch diameter charging opening and an 18-inch discharging opening, a power loader 15½ inches deep, a low-charging hopper 36 inches above ground, a truck frame width of 48 inches and a length of 45 inches. The chute when in discharge position is 26 inches above ground and the capacity of the unit is 5 cubic feet of mixed concrete. Power is furnished by an International Harvester engine, developing 5 hp at 1,000 rpm, with a built-in 2:1 speed reducer providing 500 rpm on the power take-off shaft.

The unit is mounted on steel tires, but solid rubber or 5.00 x 16-inch pneumatics are also available. The wheels are of pressed steel with Timken bearings.

The new bulletin containing complete specifications on this new mixer may be secured upon request direct from the manufacturer by mentioning this magazine.

A New One-Way Snow-Plow With Shovel Blade

The Good Roads Model 400 snow-plow for use with 1½ to 2-ton trucks, announced by the Good Roads Machinery Corp., Kennett Square, Penna., is designed primarily for use on state, county and township highways.

The lift and angle of the moldboards on all models of these shovel blade plows is so designed as to require a minimum of truck effort in penetrating, lifting and rolling the snow aside. The thrust is straight into the nose of the plow.

Other features of these plows are swivel plow connection to the underframe allowing the plough to conform to the road contour; push frame adjustments for length, allowing the plow to be set close to the truck; pivoting chilled iron shoes; screw adjustment for blade clearance; outside spring-cushioned push bar as optional equipment, for supporting the rear end of the offset moldboard and compensating for side thrust. This plow is offset from the center line of the truck by approximately 10 inches.

The overall length of the plow is 11 feet 4 inches, its length at the cutting edge is 8 feet 9 inches, the plowing angle fixed at 37 degrees and the plowing width 7 feet without landside and 8 feet with landside. The cutting edge of the plow is of high carbon steel and renewable, and the unit has a clear-vision hydraulic lift.

Complete information on this and other models of Good Roads snow-plows is contained in a new catalog which may be secured by interested state, county and township engineers direct from the Good Roads Machinery Corp.

Tax Problems

(Continued from page 28)

tory time, it may be considered advisable to become subject to such laws in accordance with the appropriate provisions incorporated in these Acts.

The wording of the provision of the New York Act is as follows:

"Any employer (of any persons within the state) not otherwise subject to this article shall become fully subject thereto upon filing by such employer with the Commissioner of his election to become fully subject thereto for not less than two calendar years, subject to written approval of such election by the Commissioner."

This question will never arise in the case of substantial businesses because the number of employees and hours will be greater than the statutory minimum.

A similar election would exist where shrinkage of the employees during the last calendar year falls below the minimum number of persons prescribed in the Act. The employer who has been subject to the Act may, by filing written application, pursuant to the provisions of the Act, cease to be subject thereto. However, if the decrease in the number of employees is due to a temporary cause and a greater than the statutory number is anticipated at a not remote time, the disadvantage of changing status in respect to unemployment insurance will sometimes offset the advantage of escaping the Federal tax or state contributions.

Importance of Records

One of the most important steps in the methodical approach to planned tax economy is the utilization of adequate accounting and tax information records. The Federal Revenue Act is based upon financial facts, and under Federal and state laws detailed records are prescribed. These records must be accurately kept if the taxpayer is to maintain the burden which rests upon him in cases of dispute, of establishing the true tax base. By far the great majority of the cases of deficiency assessments and overpayments brought to issue in the Bureau of Internal Revenue, the Board of Tax Appeals and in the courts, are due to the neglect to keep proper records.

A discussion of the records required under the Federal Social Security Act and state payroll tax laws will be presented in a succeeding article.

The scope of the present article has been largely introductory, by way of elucidation of the principles underlying the technique of tax economy. In the article which will appear in the December issue, a detailed discussion of the pre-determinable tax effects of the Federal Social Security Act and state payroll tax laws will be presented from the standpoint of those taxpayers who are engaged in the highway contracting and heavy construction industry.

Highest Czechoslovak Road Completed in Bohemia

The new highroad in the Giant Mountains located in the northeastern part of the province of Bohemia, Czechslovakia, which was started in 1931, has been completed. It leads from Jilemnice up to the mountain ridge, from a point 1,361 feet above sea level to 4,615 feet and measures 14.4 miles in length, the steepest grade being 10 per cent.

The road surface is paved partly with concrete and partly with granite blocks, the total cost being about $506,700, according to a report from the U. S. Bureau of Foreign and Domestic Commerce. The road was so constructed as not to impair the beauty of the scenery and it is expected that it will promote tourist traffic.

Arthur G. Hayden Opens Consulting Office

Arthur G. Hayden, M. Am. Soc. C. E., who has resigned as Designing Engineer for the Westchester County Park Commission, White Plains, N. Y., has opened a consulting office at Room 1906, 347 Madison Avenue, New York City. Mr. Hayden's services as a consultant in preliminary investigation, design, estimates and reports for grade separation projects, including their bridge structures, are available to state highway departments, county departments and municipalities. He and his staff are prepared to assume full responsible charge of projects of this nature from inception to completion, including supervision of construction.

Mr. Hayden developed the design and construction of the rigid frame bridge, a new structured type having distinct advantages in point of economy and adaptability to architectural treatment. Rigid frame construction also has been applied with economy to the roofing of large areas for auditoriums, industrial buildings, etc.; the omission of trusses adding beauty to the structures, improving lighting and eliminating waste space and encroaching obstructions.

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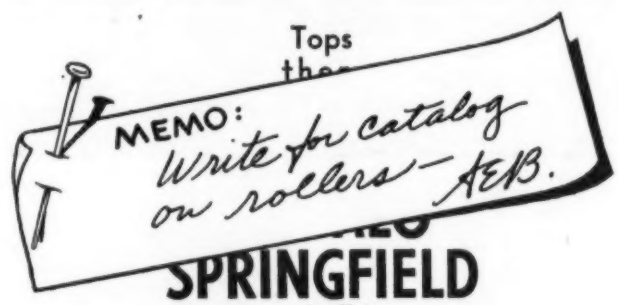

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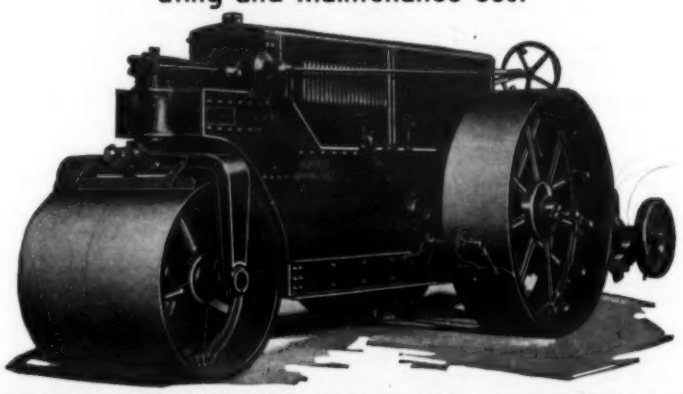

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For free distribution to contractors, engineers and officials. Write for the catalogs you need.

One-Way and V-Type Snow Plows

868 Frink one-way speed Sno-Plows which are interchangeable with the standard Frink V Sno-Plow as regards mounting on trucks are described in a pair of new illustrated catalogs which may be secured from Carl H. Frink, Mfr., Clayton, 1000 Islands, N. Y.

New Catalog on Road Rollers

869 Hercules road rollers in 6, 7, 8, 10, 12 and 15-ton sizes, features of which are the Ironer Roll, scarifier and grade blade attachements as well as its rugged construction, low operating cost and design for long life, is described and illustrated in a new Bulletin No. H-3625, copies of which may be secured by interested contractors, state and county highway engineers direct from the Hercules Co., Marion, Ohio.

Mixer for Repairing Concrete Roads

870 The Blystone All-Purpose mixer, which is designed particularly for use by state and county highway departments and also by contractors in repairing concrete pavements, is described and illustrated in literature which may be secured direct from the Blystone Mfg. Co., Cambridge Springs, Penna.

Sand and Gravel Washers

871 Eagle sand and gravel washers of the screw and paddle types, to provide clean sand and gravel, are described in Bulletin W2 which may be secured direct from the Eagle Iron Works, Des Moines, Iowa.

Equipment for Road Builders

872 Blaw-Knox road builders' equipment, including road forms, gas and gas-electric road finishers, batcher plants and bins and many other accessories, is described and illustrated in literature which may be secured direct from the Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Penna.

Engines for Heavy-Duty Service

873 Complete details and specifications on the Waukesha-Hesselman oil engines, designed for heavy-duty service in shovels, cranes, hoists, draglines, portable and semi-portable construction equipment, are contained in Bulletin 918 which the Waukesha Motor Co., Waukesha, Wis., will be glad to send on request.

Make the Gasometer Test

874 To substantiate its claim that the Dodge truck saves gas, Dodge Brothers Corp., Detroit, Mich., has arranged for anyone interested to make the gasometer test through the local Dodge dealer, to show how far any truck, old or new, goes on a gallon of gas, leaving you to make your own comparison. Write direct for arrangements.

Pile Hammers and Extractors

875 McKiernan-Terry Corp., 19 Park Row, New York City will be glad to send to those interested its literature in McKiernan-Terry pile hammers and extractors, as well as on its hoists, derricks and whirlers.

Up-to-Date Gravel Plants

876 Bulletin G-34, describing Telsmith screening and crushing machinery for equipping a modern up-to-date gravel plant, as well as including full information on Telsmith engineering and equipment service, may be secured free upon request from the Smith Engineering Works, 4014 N. Holton St., Milwaukee, Wis.

Three-Wheel Hydraulic Elevating Grader

877 The Austin-Western elevating grader, features of which are its three-wheel construction, trough-type belt, hydraulic power control, furrow wheel and stiffleg plow, is described and illustrated in a new catalog which the Austin-Western Road Machinery Co., Dept. Y, Aurora, Ill., will be glad to send on request.

Controlled Ignition Tractors

878 Complete information on the Model K-O diesel fuel tractors, with standard or wide treads, the feature of which is the controlled ignition engine, is contained in a new illustrated booklet which the Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wis., will send on request.

Machine Builds Underground Tunnels

879 T & M tunnel shields for constructing concrete-lined tunnels of 4 to 8 feet inside diameter without disturbing the surface of the ground, and which may be secured on a rental basis at a fixed price per linear foot of tunnel constructed, are described and illustrated in a new Folder 1591 which may be secured by those interested from the Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

A New Paving Breaker

880 The No. C-80 paving breaker, an improved model which is fully air-cushioned and has a number of new features, is described in literature which the Hardsocg Wonder Drill Co., 227 S. Benton St., Ottumwa, Iowa, will send on request.

Shovels, Cranes and Draglines

881 Complete information on Northwest shovels, cranes, draglines, pull shovels and skimmers, in a wide range of fifteen sizes of ⅜-yard capacity and larger, with gasoline, oil diesel, or electric power, may be secured from the Northwest Engineering Co., 1730 Steger Bldg., 28 East Jackson Blvd., Chicago, Ill.

Buckets for Every Job

882 The Hayward Co., 32-36 Dey St., New York City will be glad to send to interested contractors complete information on the complete line of Hayward clamshell, dragline, electric-motor and orange peel buckets to meet every construction requirement.

New Catalog on Contractors' Pump

883 A new catalog and prices on the Jaeger 100 per cent automatic priming Sure Prime pump, in 2 to 10-inch sizes, with capacities from 7,000 to 200,000 gph, may be secured by those interested direct from the Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio.

Two-Wheel Portable Mixers

884 CMC's new two-wheel trailer mixers, in one and two-bag sizes, with pneumatic, dual, solid-rubber tired or steel wheels, are described in literature which the Construction Machinery Co., Waterloo, Iowa, will be glad to send on request.

New Bulletin for Contractors

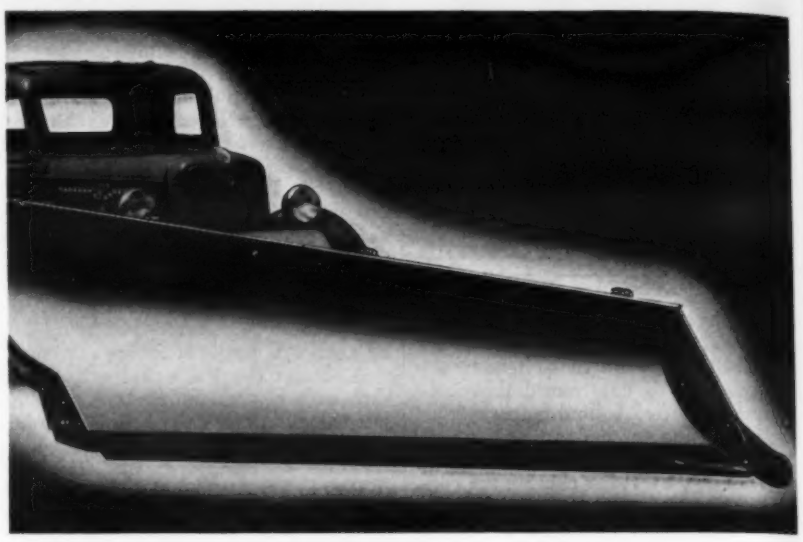
885 A new 24-page bulletin, illustrating and describing the complete line of Worthington equipment for contractors, including compressors, wagon and rock drills, diesel and gas engines for powering construction equipment, pumps for drainage, dewatering and dredging operations, and similar equipment, designated as Bulletin WP-1061, may be secured by interested contractors direct from Worthington Pump & Machinery Corp., Harrison, N. J., by mentioning this magazine.

A New Long-Range Dragline

886 Two new draglines, especially designed for long range operation, such as large drainage projects, quarry stripping, levee work and wide canal excavation, have just been announced by the Koehring Co., 3026 W. Concordia Ave., Milwaukee, Wis., from whom literature on these Models 702 and 802 may be secured free on request.

New Bulletin on Distributors

887 A new 12-page well-illustrated bulletin describing the Kinney bituminous distributors in three general models, A, the all-purpose heavy-duty unit; B, the special purpose unit, and C, for general service, has just been issued by the Kinney Manufacturing Co., 3529 Washington St., Boston, Mass., who will be glad to send copies on request.



ROSS SNOW PLOWS
Better Than Ever for 1937

FROM the day of their origin, Ross Snow Plows have been recognized as the leaders in the field. Ross 1937 plows, excel even the fine Ross plows of 1936. They embody many new and exclusive features found in no other plows. It will pay every buyer of plows to compare Ross plows with the field.

- "One-Way" Plows
- "V"-type Plows
- Reversible Plows
- Non-Reversible Plows
- Wings

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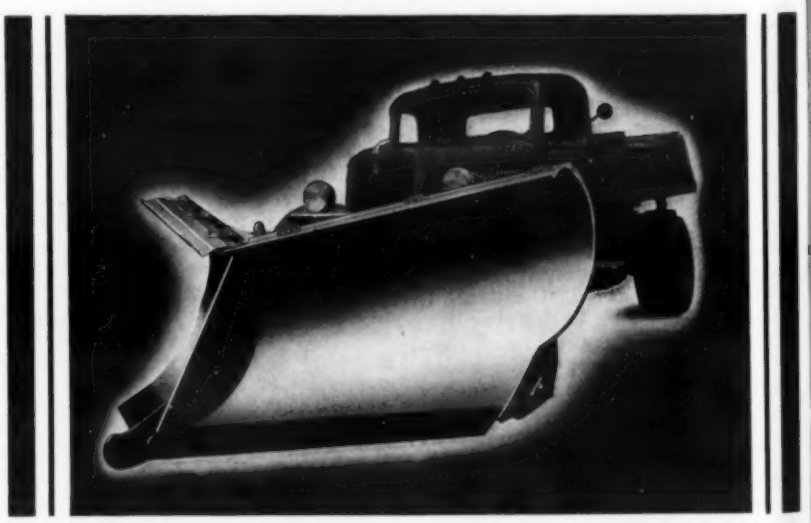
THE BURCH CORPORATION
CRESTLINE, OHIO



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Cement, Aggregate Weighing Batchers

888 The C. S. Johnson Co., Champaign, Ill., will be glad to send to interested contractors complete information on Johnson autoweigh batchers and mixing plants, installations of which have been made at Bonneville, Madden, Norris, Tygart, Guntersville, Grand Coulee and other dams, as well as on the other Johnson cement and aggregate handling equipment.

New Literature on 1937 Snow Plows

889 Ross snow plows, in the one-way, V-type, reversible, non-reversible and wing models, which are claimed to have a number of new and exclusive features, are described and illustrated in literature which may be secured on request from The Burch Co., Crestline, Ohio, by interested state and county highway officials.

A New Ditcher and Excavator

890 Complete information on the new Ruth heavy-duty excavating unit for constructing ditches and similar excavating jobs, in capacities of 120 to 240 cubic yards an hour, may be secured direct from the Ruth Dredger Mfg. Corp., 5980 So. Boyle Ave., Los Angeles, Calif.

Equipment for Heavy Rock Work

891 Gardner-Denver Co., Quincy, Ill., will be glad to send to interested contractors and engineers complete information on its line of air compressors, sinkers, rock and wagon drills, which are particularly designed to meet the severe operating conditions of heavy rock work.

Steel Dredge Cutter Heads

892 Amsco manganese steel cutter heads, in the rotary, basket, combination, rock and spider types, are described and illustrated in Bulletin No. P8 which the American Manganese Steel Co., Chicago Heights, Ill., will be glad to send on request.

Bituminous Pressure Distributors

893 Complete information on the Littleford Model C pressure distributor, as well as on other Littleford asphalt equipment, may be secured upon request from Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio.

A New Rock Grapple

894 Owen Bucket Co., 6030 Breakwater Ave., Cleveland, Ohio, will be glad to send to interested contractors complete information on the Owen rock grapple which is designed on an entirely new principle so that all four tines are effective at every grab.

Heavy-Duty Trucks for Contractors

895 Complete information on International trucks, in all sizes to serve all hauling needs, many of which were used in the heavy hauling at Boulder Dam and others of which are in use at Bonneville, may be secured by interested contractors, state and county highway engineers from the International Harvester Co., 606 So. Michigan Ave., Chicago, Ill.

Power for Construction Equipment

896 Hercules Motors Corp., Canton, Ohio will be glad to send on request complete information on its complete line of gasoline and diesel engines, from 4 to 200 hp., for powering construction and road building equipment.

Heavy-Duty Machinery Trailers

897 Catalog No. 633, describing Rogers heavy-duty trailers for hauling heavy machinery and materials, may be secured by those interested direct from Rogers Bros. Corp., 108 Orchard St., Albion, Pa.

Steel Road Forms

898 Bulletins 101 and 200, describing Heltzel steel road forms and special steel forms respectively, for all types of concrete construction, may be secured free upon request from the Heltzel Steel Form & Iron Co., Warren, Ohio.

New Welded Dragline Buckets

899 Bulletin D4, describing and illustrating P & H dragline buckets, in sizes from ⅜ to 4 cubic yards, a feature of which is their all-welded construction, may be secured by those interested direct from the Harnischfeger Corp., 4419 W. National Ave., Milwaukee, Wis.

Form Clamps and Wale Supports

900 Williams form clamps and wale supports, which are designed for speed, economy and safety, are described in literature which may be secured upon request from the Williams Form Engineering Corp., 1244 Prospect Ave., S.E., Grand Rapids, Mich.

Power Units for Tractor-Drawn Equipment

901 Le Tourneau power units for providing fast-acting, accurate cable control for tractor-drawn equipment, which are simple in design and easy to operate, are described in a new catalog which R. G. Le Tourneau, Inc., Peoria, Ill., and Stockton, Calif., will be glad to send on request.

Reo To Manufacture Trucks Exclusively

The Reo Motor Car Co., Lansing, Mich., has announced that henceforth it will concentrate exclusively on the manufacture of commercial vehicles. D. E. Bates, President and General Manager, stated, "We feel that the day has passed when trucks and busses can be considered as side lines. The truck and bus and trailer engineer has nothing more to learn from the passenger car. Today, he must concentrate his entire attention on the problems presented by the increasing demand for efficiency in commercial vehicles, if he hopes to keep pace with progress."

The Reo Company was founded in 1904 by Ransom E. Olds who still retains an active interest in its management as Chairman of the Board. Mr. Bates has been President and General Manager of the Reo Company since 1934, and for 20 years previous was Secretary-Treasurer.

Mesh Strike-Off Machine

The new Flex-Plane mesh strike-off machine for striking off the concrete below the forms to any depth specified to permit the placing of the reinforcing mesh and steel has been announced by the Flexible Road Joint Machine Co., Warren, Ohio. The machine is equipped with a 2-cylinder 8-hp engine, with a transmission unit for speeds forward and backward. It is so arranged and underslung to permit the paver bucket to swing over the center section. It is equipped with a reciprocating strike-off blade which can be set to various crowns of pavement.

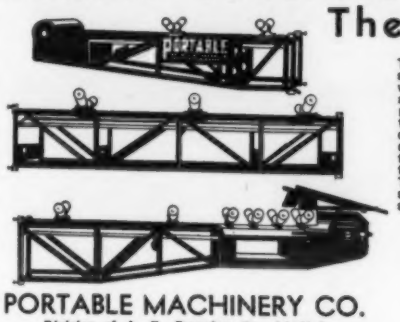
These machines are furnished for striking off concrete from 10 to 20 feet in width. The approximate weight of the 10-foot unit is 2,900 pounds and the 20-foot unit 4,100 pounds. The Flex-Plane mechanical strike-off is illustrated and described in Bulletin R-7 which will be sent to readers of CONTRACTORS AND ENGINEERS MONTHLY free on request to the manufacturer.

New Sales Manager for Novo

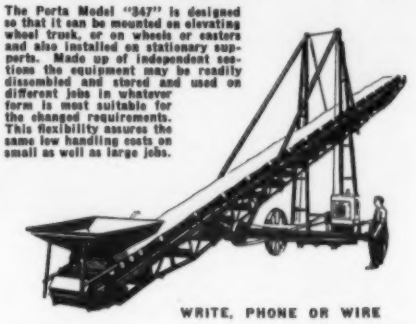
According to a recent announcement by the Novo Engine Co., Lansing, Mich., R. B. Harvey has been appointed General Sales Manager of that company. Mr. Harvey has been associated with Novo for nine years, all of which have been spent in charge of the Central Sales District which includes a large portion of the United States and Canada.

It is Mr. Harvey's plan to carry out the Novo policy of close contact and co-operation with their equipment distributors, which number over eighty in the United States and Canada at the present time.

Handle Concrete and Aggregates The Economical Way



The Porta Model "347" is designed so that it can be mounted on elevating wheel truck, or on wheels or casters and also installed on stationary supports. Made up of independent sections the equipment may be readily dissembled and stored and used on different jobs in whatever form is most suitable for the changed requirements. This flexibility assures the same low handling costs on small as well as large jobs.



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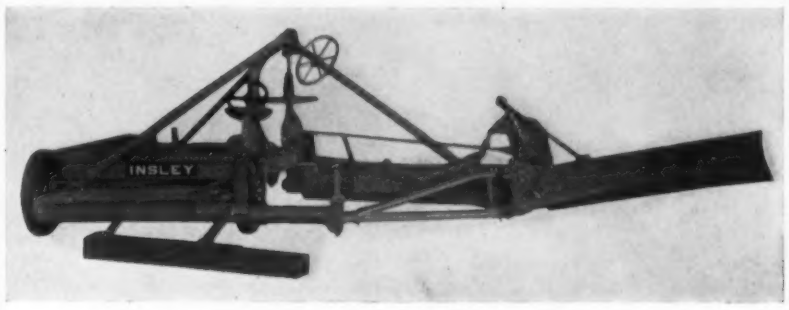


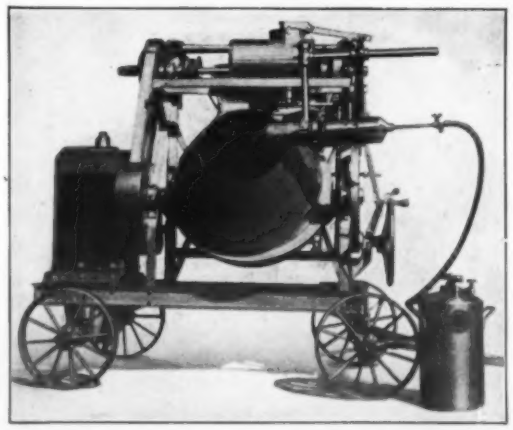
HERE IS WHAT IT WILL DO

This Shoulder was Finished with an Insley Shoulder Finisher at the Rate of One Mile Per Day—Both Sides. Notice the Sharp and Uniform Slope Line.

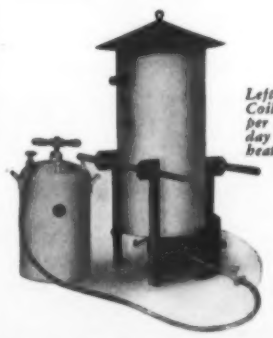
INSLEY MFG. CORP.
801 N. Olney St.
INDIANAPOLIS, IND.

ARE YOU READY for WINTER?

Don't let freezing weather stop or delay your construction work. Be ready. Equip with Littleford Concrete Heaters, Oil Burning Water Heaters and Salamanders. Use the best. Ask for prices—immediate deliveries.



Right: Littleford Concrete Heaters fit all types and makes of mixers, large or small. They assure you of pouring at proper temperatures regardless of the weather.



Left: Littleford Oil Burning Jacketed Coil Water Heaters heat 300 gallons per hour from 33° F. to 175° F. all day long. You get double use of the heat from the burner.

THE SIGN OF A GOOD HEATER LB LITTLEFORD BROS. CINCINNATI

LITTLEFORD
Road Maintenance Equipment
SINCE 1900
LITTLEFORD BROS. 485 E. PEARL ST. CINCINNATI, O.

C. & E. M. Photo

Noon Hour On a Levee Job. The Regular Refueling and Greasing of This Big Tractor and Crawler Wagon Outfit, Which Is Doing Its Share Toward Curbing Ole Man River, Kept Things Moving Smoothly and Speedily on This Contract.

C. & E. M. Photo

Kone Karts Delivering Cement to the Batch at C. H. Atkinson Paving Co.'s Batching Plant in Pacific, Mo., for Its 6.429-Mile Widening Contract. See Page 1.

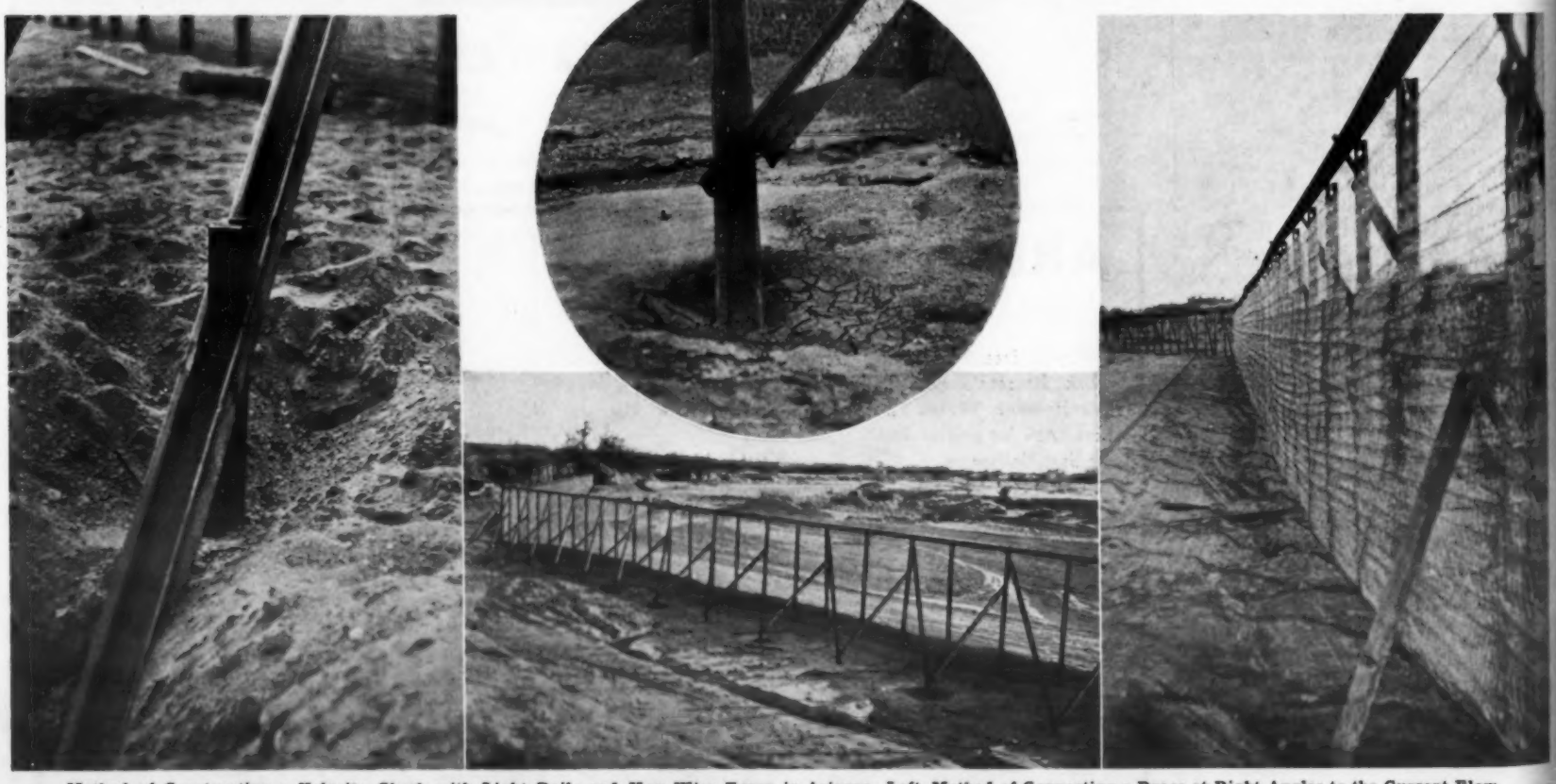
C. & E. M. Photo

Atkinson's Special 10-Foot Alloy Straight-Edge Used on Its Concrete Road Widening Job in Mo. Which Was Carried on Without Interruption of Traffic. See Page 1.

A Road in Lancaster County, Nebr., Opened Up by One of Its Tractor V-Plows Last Winter. See Page 15.

C. & E. M. Photo

A 14-Foot Span MultiPlate Culvert Near Mitchell, Ind. See Page 32.



Method of Constructing a Velocity Check with Light Rails and Hog Wire Fence in Arizona. Left, Method of Connecting a Brace at Right Angles to the Current Flow. In Circle, a Brace at Right Angles with the Fence, Showing the Connection to the Other Brace and the Deadman. Center, General View of the Back of a Check at a Bend. Right, Face of the Same Check Before a Flood. See Page 1.